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TECHNICAL CHANGE AND THE TRANSFORMATION OF WORK: THE CASE OF THE BRITISH COAL INDUSTRY

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'It is questionable if all the mechanical inventions yet made have lightened the day's toil of any human being'

- John Stuart Mill, Principles of Political Economy, 1888.

'What', asked the French lecturer on the Science of Metals and Mining, 'is the most important thing to come out of a coal-mine?'

'Coal', replied the students.

'No', said the lecturer, Frederic Le Play, 'the most important thing is the coal-miner'.

- F.D. Gould 'Le Play', Sociological Review, (1927)

ABSTRACT

This thesis examines the suggestion that dramatic changes are occurring in the organisation of work and production, and that these amount to the emergence of a new 'post-Fordist' industrial paradigm. In particular, the claim that introduction of new forms of microelectronic-based technologies is leading to the emergence of new forms of skilled work, and that, as a result, old forms of industrial conflict are ameliorated, is analysed. The value of this conceptualisation of contemporary workplace change is questioned. A critique of the 'post-Fordist' argument is offered. This stresses: that new tendencies in the organisation of work can be discerned but that generally these are occurring alongside enduring forms of hierarchy and control; that the new forms of work and production represent a reformulation of traditional capitalist concerns of efficiency and control through the extension of 'flow principles'; and that the pattern of change in reality is highly uneven and spatially differentiated. An examination of the pattern of workplace restructuring in contemporary Britain reveals that it owed little to the unfolding of a new, universal industrial paradigm, and more to a peculiar concern with the alleged 'restrictive practices' of labour. Significant changes in work and industrial relations are acknowledged to have occurred, but are seen as owing less to the inherent properties of new technology than to historically developed pattern of social conflict and compromise. The study then offers more substantial evidence of the nature of workplace change through a case-study of the nationalised British coal industry. The post-war process of mechanisation and the rationalisation of work and industrial relations is analysed. It is argued that in the 1970s a strategy of technical change was initiated in which microelectronic-based technologies were important. The impact of this restructuring on two coalfields - the North East and Selby - is examined. Although centrally-determined, the pattern of restructuring was highly uneven and, in each case, was overlain by a concern with alleged labour indiscipline. Thus restructuring owed as much to dominant perceptions of the British industrial problem, as did it did to the demands of new technology.

CONTENTS

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CHAPTER ONE

INTRODUCTION

1. PREAMBLE

Since the early 1970s the pace of change in the social and technical organisation of production has quickened to such a degree, that there now exists a popular view that the advanced capitalist societies face an historical turning point. Changes in the workplace are seen by some social scientists to be at the heart of wider processes of societal transformation. They point to the widespread dissemination of microelectronic-based production technologies and to radical innovations in the social organisation of work; developments providing the basis for reversing the crisis of profitability and productivity of the 1970s and securing the transition towards a new regime of capitalist development.

Relatedly, the debate on the nature of work, too, has undergone a significant change. In the 1970s, to a large degree, the debate was dominated by Braverman's thesis, advanced in his seminal text Labor and Monopoly Capital (Braverman, 1974), that the organisation of work under capitalism is characterised by a long-term tendency toward deskilling, based on the growing application of Taylorist forms of labour control. Braverman's theory was linked to a set of predictions derived from Marx, which associated the development of capitalism with the

growing alienation of the direct producers from the product of their labour. Given the publicity surrounding phenomena such as 'blue collar blues' and incidents of sabotage and strikes which characterised the period in which Braverman was writing, it is not surprising that, at least initially, his ideas had a receptive audience. By the late 1970s, however, a strong critique had begun to develop against Braverman's central thesis on the tendency within capitalism towards the progressive degradation of work. Broadly, the critique centred around two claims. First, it was argued that there is no immanent movement towards deskilling within the capitalist labour process, and that capitalist exploitation of labour power can take many forms, including the exploitation of a skilled labour force. Later, a growing body of writers began to argue that the labour process has witnessed a set of social and technical developments which raise the possibility - or even the likelihood - of a general 're-enchantment' of work. While generally accepting Braverman's assessment that past forms of work organisation were characterised by a tendency to deskill workers, it is argued that recent developments have reversed this historical tendency.

While Braverman's work, therefore, inspired a body of research concerned to identify the nature and contours of workplace control and deskilling, the implication of more recent arguments is that the nature of work has changed so much that new issues outside the conceptual framework set by Braverman need to be addressed. With this latter shift in focus a new air of optimism has come to surround thinking on the future of work. Writers concerned with the possibility of developing more humane forms of work within capitalist society now

believe that the trends in industrial organisation, market structures and, above all, production technology are working in precisely this direction. In particular, the perspective on the social effects of new information technologies in production has changed. The latter are now seen to be giving rise to new kinds of competences and occupational categories which will raise the level of human participation in production and lay the basis for more harmonious work relations.

In Britain, this general optimism about the direction of workplace change has been advanced most vigorously by the journal Marxism Today, which has blended the various optimistic views on contemporary change into a unified perspective on a future, described as 'post-Fordist'. New technology is said to be bringing into being new forms of work organisation which are both more efficient and more humane. It is further argued that this transition has been presided over by the policies and politics of the New Right as expressed through the practice of Thatcherism.

However, the vision of new and better times builds upon a number of unresolved questions. What, for instance, is the relationship between technical change and the emergence of new forms of work organisation? Do new technologies and innovations in work practices offer a general solution for the crisis of profitability through improved capitalist efficiency in all industries and national economies? Has the experience of introducing new forms of work organisation been compatible, universally, with the objectives of 'humanisation'? Is it sensible to conceive of contemporary change in terms of a sharp break with the

past? In short, is there an alternative way of conceptualising industrial change?

The aim of this study, therefore, is to put this optimistic assessment of the nature of contemporary workplace change under scrutiny. The study critically examines the argument that the trend of technical change, particularly in large scale industry, is in the direction of more enriched work and that this necessarily offers the basis for a new accommodation between capital and labour. The various theoretical components of the new optimism are identified and their conceptual and empirical bases are analysed.

Arising from this critique, the possibility of an alternative explanation of the direction of contemporary workplace change is discussed. There are two elements to this discussion. The first raises the possibility that the emergence of new tendencies in workplace organisation may be occurring alongside old enduring forms of workplace hierarchy and control. Thus, it is proposed that new forms of work organisation might represent the reformulation of traditional capitalist concerns of efficiency and control. Secondly, an attempt is made to square the argument that new technologies are propelling management to cultivate a new skilled, more cooperative workforce, with evidence which suggests the persistence of endemic, if uneven, forms of industrial conflict. Broadly, the aim of this study is to question the value of conceiving contemporary change in terms of the unfolding of a new, universal, industrial paradigm. In particular, the capability of the new optimistic

visions of the future to cope with diversity and uneveness in the process of industrial restructuring in the real world is analysed.

The study seeks to illustrate that national and historical factors play a central role in shaping patterns of change. This point, together with the two preceding objectives is highlighted by a discussion of the historical pattern of change in British industry. A review of the evidence of change during the 1980s illustrates the difficulties of conceptualising contemporary change in Britain in terms of the emergence of a post-Fordist industrial paradigm. While important changes are acknowledged to have occurred, and while it is accepted that the Thatcher governments played a key role in them, it is argued that these changes did not lay the foundation for post-Fordist production, along the lines suggested by the optimists. Taking into consideration also the emphasis which official and other accounts have placed on the historical problem of 'restrictive practices', it is argued that, in the British case, the nature of change has been more limited and conflict-ridden than implied by the post-Fordist thesis. It is also sustained that, generally, changes in the organisation of work have owed less to inherent properties of new technology than to an historically developed pattern of social conflict and compromise, which has given rise to a particular, rather constrained, view of the industrial problem. The particular role played by the state (through its ownership of the nationalised industries) in inflecting the direction of workplace restructuring in Britain, is emphasised.

Having suggested that restructuring in British industry generally owed less to the unfolding of a new 'post-Fordist' logic of economic rationalisation, the study offers more substantial evidence through a case-study of change in the nationalised British coal industry. The choice of the coal industry is justified on a number of grounds. Firstly, it provides an antidote to the large number of studies of a small range of industries (notably motor manufacture) on which the assertions about post-Fordism are based. Although the coal industry is an 'old', extractive one, I show that, from mid-1970s, the industry embarked on a large-scale strategy of productive modernisation based around the introduction of microelectronics. Therefore, the coal industry offers a different insight on the tendencies identified by the new optimism. Secondly, the fact the industry was state-owned and, latterly, under the strong influence from the Thatcher governments, helps to illuminate the specific nature of restructuring in Britain.

2. STRUCTURE OF THE STUDY

The structure of the study follows this broad argument through a number of stages. Chapter Two begins with an analysis of the schools of thought which form the basis for the optimistic view of contemporary workplace change. The chapter offers a critical assessment of these different schools, all of which advance the hypothesis that the advanced industrial societies stand on the edge of a new 'post-Fordist' era wherein industrial production will be both more efficient and more humane. Four major propositions, some of which inform each other, and which together form a 'new orthodoxy' are identified: the theory

of flexible specialisation; claims about the alleged 'Japanisation' of industrial production; the theory of 'new production concepts' as developed in Germany; and some recent inflections within the French 'regulation approach'.

Perhaps the most popular among these conceptualisations of change is the theory of flexible specialisation, associated with the work of Michael Piore and Charles Sabel (Piore and Sabel, 1984). This approach identifies the 're-emergence of craft-work' in industrial production, based on the widespread use of computer technology. The principal argument is that the system of mass production is in crisis. This system, it is argued, which was based on a combination of extreme task fragmentation and the use of dedicated machinery in the manufacture of long runs of standardised commodities for stable and undifferentiated mass markets, is being rapidly transformed. Mass markets are said to have reached saturation point, with consumer demand having become more heterogeneous, with a new emphasis on specialised and quality commodities. The ability to respond to rapidly shifting demand is said to require the flexible use of computer reprogrammable production technologies, which reduce manufacturing lead times allowing rapid changeovers in product runs.

In relation to the workplace it is argued that new, 'flexible' forms of work organisation must accompany new production technologies in order to guarantee their success. Piore and Sabel go so far as to see in this a 'revitalisation of craft-work', which reverses the trend toward the degradation of work and, most importantly, raises the possibility of a

new, mutually beneficial, bargain between capital and labour. The ability to adjust rapidly to changing market conditions requires the active participation of workers and requires the relaxation of hierarchical forms of labour control and the elaboration of a consensual industrial relations, in a new 'industrial paradigm'.

The second and parallel thesis considered is one which anticipates the extension of the Japanese of model industrial production and workplace organisation to hegemonic status. Particularly in Britain and the United States, a view has been propagated which suggests the long term productivity crisis can be overcome if Western countries emulate 'Japanese' methods of production. More importantly, the 'Japanisation' thesis has been mobilised into the broader 'post-Fordist' conception of contemporary industrial change and, in particular, Japanese production systems have been taken as evidence for the emergence of more humane forms of work organisation (see for example Kaplinsky, 1988; Kenney and Florida, 1988).

This debate is of particular relevance to the UK. Successive Conservative governments of the 1980s extolled 'Japanisation' as one the main tools for restoring British competitiveness. Looking for a 'demonstration effect' on British companies the British government has actively encouraged Japanese manufacturers to locate plants in the UK. The discussion of Japanisation outlines some of the key features of Japanese production methods and suggests that, in general, they are distinguished by an intensive utilisation of labour, rather than the use of specific technologies.

The third optimistic theorisation of change in the workplace which is considered, derives from Kern and Schumann's (1984a) work emphasising the significance of 'new production concepts'. This approach claims to identify the emergence of a trend toward task integration, with positive implications for labour. Kern and Schumann suggest that while the end of capitalist rationalisation (ie. the improvement of labour productivity with the aim of improved valorisation of capital) remains unchanged, the means by which it is being achieved is being altered. They argue that with the development of more complex production technologies, capitalist enterprises have abandoned the conception of human labour as simply a cost to be minimised and instead have begun to regard labour as a 'positive planning concept' and this is signified by the emergence of a new type of skilled worker. The task of the labour movement, they suggest, is to ally itself with 'modernist' factions of management in their battle with the 'traditionalists' for the introduction of new production concepts.

The work of Kern and Schumann is of interest to the concerns of this study because German industry is increasingly seen as the 'core' of the European economy. The review in Chapter Two of the empirical evidence in Germany itself, however, suggests the trends identified by Kern and Schumann are more equivocal and less coherent than they claim. It is claimed that while it is certainly possible to argue that the position of German workers is stronger than that of their British counterparts, the question of whether these are the product of technical change or owe more to the prevailing pattern of management/labour bargaining and conflict, needs to be addressed.

The idea of a transition from a mass production (Fordist) to a post-Fordist economy owes much to ideas developed and disseminated through the work of the French 'regulation school'. According to Aglietta's (1979) seminal text, A Theory of Capitalist Regulation, Fordism represented a 'regime of accumulation' which lasted from the inter-war period through to the end of the 1960s. At the centre of this regime of accumulation was the growth of production based on the 'Fordist' assembly line. Aglietta identified a 'crisis' of Fordist production which reflected certain technical and social limits of this type of production. The period after the crisis is seen as one of experimentation in the organisation of the production process. Aglietta adopted the term 'neo-Fordism' to describe the character of these experiments, emphasising, in contrast to the flexible specialisation thesis, continuities between Fordist production forms and their successors.

In the original formulation, writers in this tradition tended to view new experiments in the organisation of work as having largely negative consequences for workers, through processes of work intensification and increased management control. Lately, however, some exponents of the 'regulation school', have begun to espouse a view not dissimilar to that of Piore and Sabel, that the new forms of production technology require a requalified and 'involved' workforce for their efficient operation. In particular, the early emphasis on the importance of the socially contested nature of restructuring has tended to be downplayed. Instead, there is a tendency to assume that a new economic rationality is propelling the humanisation of work. This recent optimism within the

regulation approach is the fourth conception of change which is explored.

The major criticism proposed in Chapter Two is that writers in all four schools identifying the emergence of post-Fordist forms of work, reproduce one of Braverman's key errors, namely the search for a totalising view of the forms of work and its transformation. Arising from this criticism are a number of other problems. One important point emerging from the critique of Braverman was the idea that at all stages of the development of the capitalist labour process there exists a tension between capital's wish to control labour as a commodity and the need to liberate its subjective, creative aspects. Thus, it is argued that while the post-Fordist writers may be correct to identify noteworthy shifts occurring in the balance between 'consent' and 'control', they have yet to show that the underlying character of the capital-labour relation has been altered by such tendencies.

It is argued also that what post-Fordist writers take as evidence of a new 'industrial paradigm' are in fact a set of more limited, but nonetheless significant changes, in the organisation of large scale industry. The growing capital intensity of industry, it appears, does require a heightened concern with capital utilisation and, perhaps, a new engagement with conceptual abilities of workers. However, in reality changes in technology and work practices are related in complex and often contradictory ways. While managements have begun on occasions to delegate to the shopfloor certain tasks which were previously the domain of managers and to promote a certain integration

of tasks, post-Fordist writers have tended to overlook the constrained nature of this autonomy and the limited nature of most of the new skills. Most investment in information technology and limited extensions in worker skills reflects attempts to ensure high rates of machine utilisation, rather than the creation of a new computer-skilled craft-worker.

Drawing on this critique of the post-Fordist thesis, the second half of Chapter Two outlines the elements of an alternative framework. This conceptualisation draws on insights of the early work in the 'regulation approach', the critique of 'new production concepts' which has been developed within European sociology and on certain insights from the British 'labour process debate'. A major contention of this alternative approach is that contemporary technical change does not in itself guarantee the humanisation of work. Instead the extent to which the process of restructuring remains socially contested, and the extent to which this results in a highly uneven pattern of change, is stressed. Secondly, it is proposed that the emphasis on radical new departures in production organisation, needs to be tempered by a recognition of the existence of important lines of continuity and even the intensification of previous organisational forms in production. Specifically, I suggest that social and technical innovations in the workplace continue to be united under the common managerial quest for greater integration of production and higher rates of capital utilisation. Restructuring is conceptualised as the search for new 'time and control economies', through the extension and reformulation of the principles of 'flow production', of which Fordist forms of production were one expression.

This is a historic capitalist imperative, but one which may be taking on significant new forms.

The stress on the socially contested nature of change leads to the proposition that historically determined and nationally distinctive patterns of class conflict and accommodation may be more important variables for explaining the complex and varied patterns of workplace change, than any inexorable logic built into the properties of new technologies. This argument is the guiding principle behind Chapter Three. The chapter begins by examining the various attempts by British supporters of the new orthodoxy to account for the pattern of workplace change during the 1980s. Particular attention is devoted to the argument that the Thatcher governments engaged in, and largely succeeded in laying down the foundations for a high productivity 'post-Fordist' manufacturing sector in Britain.

The chapter goes on to suggest that the Thatcher governments of the 1980s had a particularly restricted understanding of the nature of the British industrial problem, which had little to do with the kind of reforms which the new orthodoxy takes as evidence of post-Fordism. The Thatcher governments took the view that the British industrial problem was essentially one of 'restrictive practices' and the 'excessive' power of trade unions. It was this perception, rather than the management of the emergence of post-Fordism, which guided the pattern of change. The genesis of this perception of the industrial problem and the role it played in determining the specific pattern of change in Britain is examined. It is argued that while the Thatcher governments

presided over a rapid growth in manufacturing productivity, this was borne largely of a shift in the balance of class forces in favour of management, not the emergence of a post-Fordist 'industrial paradigm'. Thus, the chapter shows that, even where the state had sanctioned, in nationalised industries, large investments in new technology, the pattern of restructuring was informed by the idea that the central industrial problem was one of labour indiscipline.

Chapter Four attempts to illuminate the foregoing themes through a case study of restructuring in the coal industry. This case study is informed by the alternative theoretical framework outlined at the end of Chapter Two. This suggests that managements are currently concerned with attempts to improve production processes through the further extension of flow principles, but that their approach to this problem is influenced by industry-specific patterns of social and technical development and that these in turn are influenced by existing patterns of conflict and bargaining. To this extent restructuring in the coal industry has exhibited also a 'British' concern with the 'excessive' power of workplace trade unions and 'restrictive practices'. One argument advanced in Chapter Three is that the British state, and particularly the Thatcher governments, played an important role in determining the direction of industrial restructuring. The case study of change in the nationalised coal industry attempts to investigate this claim. Thus, while management might be expected to pursue general capitalist imperatives, this will have a hue which is the product of a specific history and geography.

Chapter Four, therefore, outlines the development of the labour process in coalmining. The chapter begins by outlining the nature of the pre-mechanised labour process, illustrating its craft-like character and the extensive workplace autonomy which miners historically exercised. The chapter then charts the progress of the mechanisation of the production process from the inter-war period. Mechanisation of longwall mining is understood as an attempt to emulate Fordist-type flow production. Changes occurred also in work-practices and patterns of industrial relations which were designed to make these more rational and to accompany the technical changes. Despite these developments, traditions of job controls survived and were reformulated to meet the demands of mechanised production. The restructuring in the industry since the 1970s is then examined. A large-scale programme of technical change was initiated in the 1970s, based on the development of a more capital intensive form of longwall mechanisation and extensive application of microelectronic control and monitoring technologies. Lately, this longer term strategy of technical change has been overlain by extensive restructuring of work-practices, which by most accounts, has underpinned the recent, widely reported rise in productivity in the coal industry. This latter development is situated in the context of the defeat of National Union of Mineworkers following the 1984/5 miners' strike - a key moment in the restructuring of industrial relations in 1980s Britain.

The implementation of the strategy of technical change and the restructuring of work practices in the post-strike period are examined through studies of the divergent patterns of change in the North East

and Selby coalfields. The findings of these studies are presented in Chapters Five and Six. Emphasis was given to the inherent uneveness of the contemporary process of restructuring and the regional case-studies attempt to capture this uneveness. No two workplaces are entirely alike. Even workplaces which have identical technologies and similar industrial relations structures can operate in very different ways. For complex and historically determined reasons local practices and power structures can differ enormously. Nowhere is this truer than in the coal industry, where there is a large literature which illustrates the importance of regional differences in the industry, in terms of work organisation, bargaining practices and traditions of industrial and political practice. Chapters Five and Six demonstrate a sensitivity to these local and regional differences.

Chapter Five is a case study of the 'old' and declining North East coalfield, which did not employ the technology at the heart of the technical change programme, but which, nevertheless, witnessed dramatically improved productivity in the period after the miners' strike. The chapter shows that despite the impact of mechanisation, work in the North East coalfield was characterised right up until the miners' strike by the existence of a set of regionally distinctive job controls. Central to management's post-strike activity was the attempt to eliminate 'restrictive practices' - even though the negative impact of these practices on productivity was assumed rather than demonstrated. In the North East case, the improved productivity is shown to be a result, largely, of an intensification of work made possible by the defeat of the NUM in the miners' strike and management's subordination

of labour. Despite the productivity improvement, the chapter questions whether the basis for sustained competitive success has been established.

Chapter Six is a case study of the new, modern Selby mine complex which was developed during the 1980s and which embodies the latest developments in production technology and has a much higher level of productivity than the North East. Selby was conceived as an explicit attempt to achieve 'continuous flow production'. To this end the mine was designed to incorporate a high level of automation and centralised monitoring of plant, to ensure adequate machine utilisation. The chapter examines the extent to which Selby embodied a radically new approach on the part of management toward labour, concomitant with the technological system. The chapter suggests that management's attitude toward labour has been confused and inconsistent. Attempts to elicit the active participation of labour have been complimented by arbitrary exercise of new-found managerial authority. Also the trend of technical change at Selby suggests that management are automating skills as far as possible. I ask, therefore, in what sense can Selby be understood as a post-Fordist mine?

Chapter Seven presents some conclusions. The diverse patterns of restructuring in the North East and Selby coalfields are compared and contrasted. The differing fortunes of the workforces in each coalfield are given particular attention. Subsequently, the experience of restructuring in the coal industry is examined in relation to the theoretical concerns of the earlier part of the thesis. The value of

conceptualising the process of change in the terms of the 'post-Fordist' paradigm is questioned. Restructuring is seen as reflecting an equivocal pattern of change and continuity which in turn was the product of a specific pattern of management/labour conflict and the political contingencies which reflected the industry's ownership by the state. In general, management's approach to restructuring tended to be influenced by a notion that the human contribution to the production process should be minimised rather than accentuated. In this regard, restructuring in coal in the 1980s owed much to the dominant conception of the industrial problem held by Thatcher governments - a view which stressed the need to subordinate the position of labour in production. I conclude by arguing that this pattern of restructuring was not inevitable but that an alternative model existed which could have been founded on the traditions of craft organisation and job controls which, in contrast to the bounded autonomy proposed by the post-Fordist model, would have laid the basis for genuinely independent workers' participation in production.

CHAPTER TWO

A NEW PARADIGM OF WORK ORGANISATION AND TECHNOLOGY?

1. INTRODUCTION

This chapter examines the claim, advanced from various quarters and in differing forms, that fundamental changes have occurred in the organisation of work and production over recent years in the industrialised countries. The aim is to assess, at a broad conceptual level, what new principles, if any, underlie the reorganisation of work in the present period and whether the changes described amount to a fundamental reorganisation of the labour process as well as guaranteeing a new and better deal for labour.

It begins, for the purposes of clarification, by drawing a contrast between the tenor of the debates of the 1970s and those since. It then examines four main positions which anticipate the rise of more benign forms of production organisation and labour practices in the post-mass production ('post-Fordist') economy. They are: the theory of flexible specialisation; claims concerning the 'Japanisation' of industry; the debate surrounding the alleged emergence of 'new production concepts' in Germany; and recent contributions of the French 'regulation approach'. In each case I explore the limits of the approach in question. This chapter then examines the debates which have

contributed to this 'new orthodoxy' and to the 'optimistic estimation of the prospects for the quality of work in industry' (Dankbaar 1988a: 26) through an analysis of the four main approaches outlined above. I suggest that the evidence for a new organising principle of work and production is flawed: while certain changes can be identified these are less dramatic than implied by the new orthodoxy. Moreover, rather than representing a radical break, they tend, in many cases, to represent an intensification of existing tendencies. My argument is that the changes identified by the 'post-Fordist' writers express many possibilities, including the continuity of elements of Fordism. Trajectories of workplace change, it is argued, cannot be understood as a product of the properties of new technology, but are conditioned by deeply embedded traditions of industrial practice, which are the themselves the product of specific histories and geographies. The notion, therefore, that technical change guarantees the prospect of the humanisation of work is unsustainable.

2. TAYLORISM AND ITS CRITICS

In general, during the 1970s debates were concerned with question of the growing hegemony of Taylorist methods of industrial control, which were based on the separation of conception and execution and extreme task fragmentation. What was remarkable about this debate was the extent to which it influenced discussion in almost all of the advanced industrial countries. In the US and UK, a 'deskilling debate' took place. In Germany discussion tended to focus on the 'polarisation of skills'. In Italy a new 'mass worker' was identified, to which the Left

attached its political hopes. The notion that Taylorist techniques were of growing importance was common. Generally it was argued that this process reflected a central tendency in capitalist production. The French writer Gorz offers a representative view:

> As a whole the history of capitalist technology can be read as the history of the dequalification of the direct producers. The dequalification process is certainly not linear: at the beginning of each technical revolution it seems partially inverted. But the general tendency immediately reasserts itself: the new qualifications demanded by new techniques are recomposed. The most qualified production workers' professional skills are carved up into sub-specializations shorn of autonomy. The power of control which they carried - and thus power over the production process - is transferred to non-workers as a separate function (Gorz, 1976: 57).

In the USA this view was echoed by Braverman (1974) in his seminal contribution, Labor and Monopoly Capital. Although much criticised this book generated a vast and productive debate in both the USA and UK about the 'degradation of work' in capitalism. For Braverman, Taylorism, with its search for the 'one best way' of work simplification through the separation of manual and mental functions, extended managerial control and allowed the speed up of work. Under monopoly capitalism, scientific management had secured a dominant position in management ideology and was a form of production characteristic of monopoly capitalism. Braverman saw Taylorism as representing the unfolding of capitalist rationality in the work process. Braverman's position was much criticised on a number of now familiar accounts. He was accused of romanticising a past craft idyll, of failing to recognise that management balanced the extension of control with the need to win consent and cooperation. Critics argued that while Taylorism was central to the managerial organisation of the work process, it was not the exclusive means of workplace organisation. In particular, marxists

criticised Braverman for implying that capital, through its domination of the labour process had secured complete control over society, pointing out that the rise of social democracy had been important in securing working class political assent in the advanced capitalist societies.

A major work which addressed at least one of Braverman's lacunae was Alfred Sohn-Rethel's Intellectual and Manual Labour. For Sohn-Rethel (1978), Taylorism represented less an expression of an immutable deskilling tendency and more an historical attempt to modify the contradictions of capitalist production. It was an attempt to offset a crisis of profitability, originating at the turn of the century, through 'speed-up' facilitated by 'coercive timing' and mechanical pacing. For Sohn-Rethel, the attempts to impose 'economy of time' in production had their fullest expression in 'flow production' as exemplified by the assembly industries which emerged at the beginning of the century[1]. This development placed new constraints on capital - notably, a pressure to reap scale economies. However, productive expansion threatened over-capacity while cut backs in production were made more difficult by rising fixed costs. Consequently it would become more difficult for firms to respond to market exigencies, hence the pressure

[1]Some writers employ the term Fordism to refer to this type of production system. The term has come, also, to take on the wider meaning of a social formation based on mass production and mass consumption.

to utilise plant in a tightly integrated fashion. In this way, Taylorism represented the attempt to impose an 'economy of time' in production[2].

However, it was Braverman's conception of Taylorism, rather than that of Sohn-Rethel's, which tended to be more influential. Industrial sociology in the 1970s, therefore, was dominated by attempts to identify the existence or extent of deskilling. However, today, a 'new orthodoxy...seems set to dominate the sociology of industry and organisations' (Hyman, 1988: 48); one which suggests a very different analysis and vision of the labour process. In contrast to the approach which sees the 'dequalification of the direct producers' as a universal and immutable expression of the logic of capitalist development, the new orthodoxy sees the principles of 'scientific management' which were established at the beginning of the century as a contingent response to historically specific circumstances.

This new orthodoxy, celebrating such concepts as craft and flexibility suggests that a new organising principle is emerging. It proposes that 'old' forms of work and production based on 'Taylorist' and 'Fordist'

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[2]However, this creates a fundamental contradiction between the 'plant economy', which he saw as increasingly planned, and the 'market economy', which he saw as increasingly anarchic. Sohn-Rethel believed this contradiction would be resolved by the transition to socialism (Sohn-Rethel, 1978: 139-180). The central issue for Sohn-Rethel was to locate the objective of scientific management within the complex developments which consituted 'monopoly capitalism': concentration and centralisation, increased imperialist rivalry, the growth of the state regulated economy, the development of mass production and consumption and the growth of reformism within working class politics (see Elger and Schwarz, 1980, who offer a sympathetic critique).

forms of control are increasingly counterposed to 'new' flexible work patterns characterised by loosened (or even abandoned) central managerial control of the labour process. In some accounts these new forms of work and production are ascribed liberating powers for labour and in others they are linked to wider processes of societal transformation - to changes related to the alleged emergence of a post-industrial or post-modern society (see Harvey, 1989). In most cases changes in skills and work patterns are linked to changes in production technologies; contributing to 'the popular impression...that the introduction of microelectronics will improve the quality of work in manufacturing industry (Dankbaar, 1988a: 25). It is the elements of this argument which are outlined and criticised in the following sections.

3. FLEXIBLE SPECIALISATION AND THE RE-EMERGENCE OF CRAFT-WORK

The theory of flexible specialisation originally developed by Piore and Sabel (eg Sabel, 1982; Piore and Sabel, 1984), has gained a pervasive influence over Anglo-American debates concerning the nature of contemporary industrial change, to the degree that some writers see it as the centrepiece of the new orthodoxy described above (Hyman, 1988; also Amin and Robins, 1990). According to Piore and Sabel the advanced industrial societies are witnessing the emergence of a new form of industrial organisation which is altering all facets of economic activity including, the nature of markets, relations between firms, and relations between industry and the state. Central are changes alleged

to be occurring in the organisation of work itself, and in the relations between capital and labour; changes in the direction of more skilled, more humane, more flexible and more efficient working practices based around the potentialities of both craft practices and advanced manufacturing technologies.

For Piore and Sabel the present is a period of breakdown of the hitherto dominant system of mass production - a system based on the production of long runs of standardised commodities for stable 'mass' markets, and involving the progressive erosion of craft skills and the growing demand for unskilled or semi-skilled operatives. The breakdown is attributed to the saturation and subsequent disintegration of the markets for mass produced goods. With the rise of increasingly differentiated and segmented markets and more discriminating consumer tastes, the rigidity of mass production methods lay in their dedication to the production of standardised commodities:

> Mass markets are the precondition for the Fordist organisation of production; when they begin to disintegrate, Fordism begins to lose its appeal. Where [mass production] calls for the separation of conception and execution, the substitution of unskilled for skilled labour and special purpose machines....specialization often demands the reverse: collaboration between designers and skilled producers to make a variety of goods with general-purpose machines (Sabel, 1982: 194).

Sabel first identified the re-emergence of craft forms of production in the small 'artisan' firms of central Italy, where he proclaimed the existence of 'high technology cottage industry: the unity of conception and execution, the abstract and the concrete' (1982: 220). Here, small firms were bound together in industrial districts by a complex

relationship of 'competition and collaboration', characterised by technological dynamism and constant product innovation.

The experience of these clusters of Italian small firms was later taken as evidence of the birth of a new organising principle in industrial production - 'flexible specialisation' - wherein craft production is replacing mass production as the industrial paradigm (Piore and Sabel, 1984: 206). While craft production was 'marginalised' during the ascendancy of mass production, Piore and Sabel now identify 'the re-emergence of the craft paradigm amidst the crisis' (1984: 205) and argue that capitalist societies stand abridge an 'industrial divide', where the possibility exists for a new phase of industrial development based on these principles. Although they state that capitalist societies could either continue down the path of mass production or move in the direction of increased flexibility, it is clear that they expect flexible specialisation increasingly to dominate industrial production and they point to an increasing number of actual examples of these production systems which they claim vindicate their hypotheses. To wit, by the 1980s, the principles of flexible specialisation, it is suggested 'had become a model of industrial development in certain regions and even, in the case of West Germany and Japan, in whole nations' (Piore and Sabel, 1984: 206).

Parallel changes, which Piore (1990) describes as 'analogous to' those occurring in the small firms sector, are identified in large-scale industries. As Sabel (1989) puts it, the industrial structures of large firms and industrial districts are 'converging'. For instance, in the car

industry mass production methods are said to be giving way to flexible specialisation where firms are increasingly engaged in the manufacture of 'specialised vehicles tailored to meet the needs of particular consumer groups', with a tendency for specialised goods to be produced by means of general purpose machines - 'broadly skilled workers using capital equipment that can make various models' (Katz and Sabel, 1985: 297, 298). This new labour requirement compels firms to offer job security as an inducement to workers to acquire the company-specific skills associated with new technology:

> Thus, the shifts in the conditions of competition have led by diverse routes to a growing concern with the flexible use of labour, and this concern has led to a preoccupation with the reorganization of industrial relations and the redistribution of rights within the factory (Katz and Sabel, 1985: 299, emphasis added).

In firms such as GM, it is argued, the changes are exemplified in developments such as the well-known QWL (Quality of Working Life) programme and in the development of the Saturn plant. These developments are taken to signify that:

> Instead of treating labor predominantly as a cost, the company began to consider reform of labor relations as part of flexible production linking new technologies, polyvalent workers, and more specialized products (Katz and Sabel, 1984: 303).

In the flexible specialisation approach there is little doubt that, propelled by the exigencies of the marketplace, the introduction of new technology is calling forth new competencies which will liberate workers from the drudgery of Taylorism. The separation of conception and execution, which Braverman saw as inherent under capitalist production, is rescinded under the new forms of production. Similarly, job hierarchies considered characteristic of 'mass production' are said to

be disintegrating with the 'decentralisation of power and authority' (Piore, 1990: 60). The 'return' to craft is deemed to be inherently beneficial for labour:

> Thus the production workers' intellectual participation in the work processes is enhanced and his or her role revitalized. Moreover, craft production depends on solidarity and communitarianism. Given these conditions of working life in craft production, there is a case for preferring it to mass production, regardless of the place accorded to unions within craft production (Piore and Sabel, 1984: 278, emphasis added).

A return to craft?

The theory of flexible specialisation is an ambitious one. It seeks to explain changes in markets, state activity, the geography of production as well as changes in the organisation of work and industrial relations. The discussion below, however, is restricted to claims concerned with the workplace, notably in relation to the supposed demise of mass production principles, not only because of the particular concerns of this thesis, but also because of the already huge body of critical writing which casts doubt on the idea of the emergence of an economy based on flexible specialisation (see Amin, 1989; Hyman, 1988).

One of the key assumptions of the flexible specialisation approach concerns the nature of technical change within mass production industries[3]. Taking the example of motor vehicles which is crucial to

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[3]Although flexible specialisation devotes much attention to the resurgence of small firms, present restructuring appears to reinforce the position of large firms. An analysis of EC level data for mergers,
(Footnote Continued)

the flexible specialisation case (see especially Katz and Sabel, 1985), the vast weight of evidence suggests that technology is not being used to facilitate rapid shifts in model types. In the first place, flexible technologies are a good deal less flexible than they are portrayed in the theory of flexible specialisation. Still less are traditional scale economies being challenged by new techniques. The commissioning costs of, for instance, robot lines, can be borne only by the largest companies. The costs of recommissioning for model changeover remain high and, as Williams et al note: 'Robots cannot be re-programmed for new models by pressing a few buttons. That is a myth' (1987: 430). It is myth which is fuelled by the flexible specialisation thesis. According to Williams et al, the more likely trend established by the introduction of FMS systems is for batch production to become more capital intensive. However, whatever variety is planned for, it remains

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(Footnote Continued)
acquisitions and joint ventures reveals that concentration of industrial activity continues to be an important trend, especially in the best performing areas of the manufacturing sector, a process encouraged by contemporary trends of trade and market liberalisation (Amin and Dietrich, 1990). Moreover, according to Amin and Dietrich, these processes of concentration, in some cases, reflect 'a deepening of old 'Fordist' forms, notably in the mass production industries or continuous flow industries in which competition is intensely oligopolistic' (1990: 15). In industries such as food, printing, chemicals and consumer goods, it is argued, 'the pursuit of scale economies remains ever present' (ibid: 16). The deployment of flexible technologies, closer coordination between product and production strategy and the extensive utilisation of advanced information and communication technologies allows closer integration between plants and divisions in different locations (Dunning, 1988; also Amin and Dietrich, 1990). Increasingly, seperate functions within production can be run as independent modules, 'but within an overall framework of an integrated flow system' (Amin and Dietrich, 1990: 17; cf. also Murray, 1982; Belussi, 1987). This evidence casts doubt on the notion of a 'craft paradigm' challenging mass production.

crucial to obtain volumes which guarantee high rates of utilisation. This evidence, and the stubborn persistence of mass markets for relatively standardised products casts serious doubts on the central proposition of the theory of flexible specialisation that scale economies are of diminished importance in the strategies of firms, although the means by which firms achieve these economies may be varied and may include closer relations with suppliers (see the discussion of 'Japanisation' below)[4].

It seems clear that where advanced production technology is being introduced often it involves large scale investment in new computer controlled production technologies, the general character of which is to

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[4]Evidence for the saturation and disintegration of mass markets is hard to find and this further undermines the claims made for flexible specialisation. Williams et al (1987) firmly reject the argument that markets for consumer durables are saturated and point to the creation of new markets for mass produced standardised goods. While they accept the evidence that markets may be fragmenting, this is occurring in ways which do not threaten mass producers. The orthodox mass producer increasingly survives by producing a family of interrelated models, but this is taken as evidence of simple product differentiation (which may be increasing in importance) rather than the 'disintegration of mass markets'. In the British food industry 'a classic mass production industry' (Smith, 1989) evidence of differential demand is 'contradictory'. For instance, Cadbury have reduced the variety of their products and tended instead to concentrate on a limited number of core brands - a trend guided by concentration in British and European retailing. Smith describes Cadbury's approach as a 'strategy of product and company globalisation, not fragmentation and decentralisation of products and ownership' (1989: 213). The persistence of volume production for mass markets , which seems to be an enduring feature of the advanced economies, casts serious doubts on the notion that flexible specialisation is 'replacing' mass production. In many cases what Piore and Sabel appear to identify is a relative vertical disintegration of the firm in the face various uncertainties in product and labour markets. From this though they impute changes in the whole edifice of advanced capitalism.

be different to that suggested by the flexible specialisation thesis. Wood (1989), for instance, through his participation in the MIT study into the future of the automobile, found that managers tended to stress the use of technology in the improvement of quality and the enhancement of central coordination and control of the production process. In the car industry, new technology appears to be used mainly for increasing routing, production volumes and programming flexibility within existing capital installations. In general, it seems that computerisation of mass production processes facilitates an improved control and integration of the labour process rather than rapid product switches. Similarly, Murray, in an earlier study of the Bologna engineering industry, suggested that systems such as CAM were being used in a way 'that ensures the maximum saturation and coordination of labour time' (1983: 88)[5].

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[5]Even within Sabel's celebrated industrial districts, however, the notion that 'computer' technology is sustaining the emergence of 'a craft paradigm' is difficult to sustain as a general principle. Lazerson (1990), who otherwise has sympathy for the features of industrial districts, questions the idea that the essence of these areas is captured in the notion of 'high technology cottage industry'. He found only very limited application of new technology in his study of the Modena (Emilia) knitwear industry. Artisanal knitwear firms are characterised by heavy dependence on family labour, low overheads, long working hours and less costly labour laws, features which reflect the frequent juxtaposition of home and workplace. The production process in the knitwear sector has proved highly resistent to technical change. The overall flexibility of the sector resides rather in the extreme division of labour between artisan firms. This evidence validates the point made by Morroni: 'The evidence placed on computer-based technology, and on the opportunities it provides for making production processes flexible, may induce people to forget that flexibility can arise from the way the elements of production are organized regardless of the technology used. In fact, flexibility in production is first and foremost an economic phenomenon, which may even be independent of the technology adopted' (1990: 16; cf. the discussion of 'Japanisation' below).

In the flexible specialisation thesis, the computer is endowed with an emancipatory potential. This view of the possibilities of the computer is used to support a view of craft-work which echoes that of Braverman:

> The computer is thus a machine that meets Marx's definition of an artisan's tool: it is an instrument that responds to and extends the productive capacity of the user. It is therefore tempting to sum the observations of engineers and ethnographers to the conclusion that technology has ended the dominion of specialised machines over un- and semiskilled workers, and redirected progress down the path of craft production. The advent of the computer restores human control over the production process; machinery is again subordinated to the operator (Piore and Sabel, 1984: 261).

This touching faith in the ability of the computer to restore a craft idyll, however, simply ignores many of the criticisms made of Braverman and leads Piore and Sabel to leave some important gaps in their analysis of contemporary change.

Firstly, while it is possible to accept that in certain cases technical change may be calling forth new kinds of competences which might 'enskill' particular groups of workers, the flexible specialisation thesis fails to address or to build into its analysis a recognition that skilled work too may be subordinated to managerial control. While Braverman postulated the progressive erosion of craft skills ('deskilling') and growing managerial control of the labour process, criticism of his position has tended to point to the continued survival of 'craft' labour processes and the more general capacity of workers to resist managerial initiative (see Elger, 1979; Thompson, 1983 for a review). The other side of this observation, however, is that forms of specialised expertise and craft competence may be embedded within a complex structure of collective labour effectively subordinated to managerial control. While

Piore and Sabel suggest that the mass production paradigm was characterised by pervasive managerial control (which is a caricature), the absence of managerial control over 'craft-work' tends to be assumed rather than demonstrated. In practice, various kinds of labour process will coexist at any one time, characterised by varying levels of managerial control, often reflecting the local balance of forces between management and labour and the particular character of product and processes.

Secondly, many writers point to the limited nature of much of what passes for 'enskilled' work. This is particularly true of attempts to upgrade semi-skilled work processes in the 'mass production' industries. A large body of case study evidence exists to suggest that the new skilled occupations entail flexibility across a range of what were previously demarcated skills or tasks, what Hyman refers to as 'an expanded portfolio of competences' (quoted in Thompson, 1989: 226). This may be as true of 'intellectual skills' as of manual ones. Here, in many cases, it seems that the scope and depth of such jobs are often: 'so routinised that they could be picked up easily by other workers' (ibid). Whether this amounts to 'humanisation' or the 're-emergence of craft-work' is contentious[6].

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[6]By way of support for this argument, Shaiken et al found that the introduction of CNC in the US manufacturing sector was leading to only limited forms of worker autonomy. Shopfloor workers tended to be given only manual override facilities, not programming capacities. This situation seemed to reflect management's wish to retain control of the basic parameters of the work process. In fact, Shaiken and his colleagues identified a dilemma in management's approach to the

(Footnote Continued)

It seems, therefore, that what flexible specialisation theory identifies as the emergence of humane, 'enskilled' work, might actually signal a more limited, if nonetheless important development in mass production industries. A relative shift may be occurring in management's attempt to engage the creative capacities of the workforce. This is related to the introduction of new technology insofar as increased capital intensity leads to a heightened concern with utilisation rates. Attempts to engage the workforce in the struggle to improve utilisation rates have become significant. Devices such as QWL appear to be a genuine innovation in the attempt by management to resolve the control/creativity dilemma. In many ways it appears as a qualitative shift in the direction of greater engagement with the creative skills and aspirations of the workforce. But, what are the terms on which such innovations are being pursued? For instance, the fascination with QWL, expressed by Katz and Sabel ignores the fact that:

> QWL is a highly constrained form of empowerment that is far removed from either of the traditional agendas of industrial democracy or job enrichment. These constraints arise from the subordination of participation within management decision-making processes, efficiency criteria and power relations that have largely remained untouched (Thompson, 1989: 226)[7].

(Footnote Continued)
introduction of such systems: while acknowledging that operator intervention is essential and that skilled workers operate CNC more effectively, managers feared that routinely allowing machinists to programme or edit would, by reducing managerial ability to supervise and coordinate work, threaten shop performance (Shaiken et al 1986, especially pages 172-3).

[7]Giordano's (1988) analysis of the introduction of QWL identifies how it can actually increase management control. QWL, she argues, has normally been introduced alongside automated production processes. Taken together these two can contribute to the recentralisation of corporate authority over production decisions insofar as both can be
(Footnote Continued)

A third major problem area is the wilful neglect of the issue of intensification. As already seen, attempts to broaden semi-skilled work processes, for instance, may often represent simply a grouping together of several related tasks. Given the limited nature of these changes, important evidence exists to suggest that managements' concern with upskilling is mainly an attempt to intensify work processes. As Shaiken et al note: 'the classification issue is primarily a battle over the intensity of work' (1986: 179). While some grouping together of tasks may reflect changed technical requirements, much of this change is concerned simply with eliminating downtime and waiting time from production processes. This is achieved by, say, requiring production workers to perform minor maintenance or inspection tasks. Intensification may also underlie attempts to alter craft demarcations. Thus apparent tendencies toward more skilled work may be facilitating intensification on a large scale and may, therefore be a Trojan horse for workers. Yet Piore and Sabel simply do not address this possibility. More significantly, though, as pointed out earlier, they see the trend toward craft labour leading to the humanisation of work in ways which suggest that unions are almost superfluous as guarantors of workers rights. They choose to focus on the issue of skills at the

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information gathering processes. The capacity for automated equipment to be used as information generators depends on workers' ability and willingness to use computerised data. QWL, argues Giordano, helps to accomplish this goal. Moreover, she recounts how information generated in this way can and has been passed up the corporate hierarchy to facilitate 'whipsawing' in the US car industry.

expense of any implications this might have for effort levels, an area in which the role of trade unions, of course remains crucial[8].

The final problem relates to the total disregard of the flexible specialisation thesis for losers and for unevenness in the process of restructuring. While Sabel contrives to represent the Third Italy as characterised by a post-Fordist harmony of craft labour, Murray (1983; 1987) for instance, has suggested that in Emilian engineering racial, gender and skill differences also play an important part in the operation of the industrial districts. The quality craft-work identified by Sabel certainly appears to exist but is the preserve of 'middle-aged, Emilian men' (Murray, 1987: 88). More enervating work processes are carried out by more marginal social groups. Semi-skilled assembly work, plastic moulding, wiring and so on is carried out by women, heavy foundry work by southern Italian men and North Africans. Murray maintains that the marginality of these groups is central to the operation of the new flexibility. In the case of engineering in Bologna there is a hierarchy of economic conditions associated with the artisan

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[8]The complete lack of concern for the intensification issue is reflected in Piore and Sabel's analysis of Japanese production methods (1984: 156-82). Here they fail to integrate the many critical accounts of the organisation of Japanese labour processes which focus on the highly intensive nature of work and the anti-social impacts of this (see section 4, below). It is also worth noting that many of the changes which flexible specialisation theorists identify as occurring in the US car industry (upskilling, QWL, etc.), are a response to and are directly inspired by Japanese competition. For Parker and Slaughter (1990) intensification is the very essence of this change which they call 'management by stress'. In the Japanese case the absence of independent trade unions is a critical factor in explaining this intensity of the work process, see section 4 below.

sector, with conditions of work ranging from highly skilled and well paid positions to dirty and deskilled ones. The division of labour constructed on racial and gender divisions is central to the operation of the small firm sector. Murray concludes that:

> The geographical fragmentation of distinct phases of a product's labour process works to create maximum wage differentials between different groups of workers. This may well be to the advantage of the skilled machinist. However, it effectively undermines the radical solidaristic wage bargaining pursued by the Italian engineering workers union, the FLM, throughout the 1970s. And it leaves the majority of workers in this sector, who do not possess these much-demanded skills open to the unmediated vagaries of market forces (1987: 88).

A more general set of points emerges from this last criticism. Piore and Sabel argue that the regions and countries with surviving craft skills are the most likely front-runners in the race to develop economic development strategies based on flexible specialisation. However, their discussion of the rise of skilled work ignores the uneven distribution of skills throughout the workforce. To this extent, they choose not to recognise the 'undesirable and costly downside' of the strategy they advocate, namely, the extent to which it will foster new divisions within the workforce (Jenson, 1990: 141). The 'unity of the abstract and the concrete' within the artisan firm may simply express a growth in polarisation of skills in the external labour market. As Jenson notes different types of labour are used in different ways: women workers, for instance, are obstructed from obtaining access to the jobs which characterise those parts of the artisan sector which Piore and Sabel admire.

In summary, it is possible to identify three major problem areas emerging from flexible specialisation theory in its application to changes in the production process. These are: firstly, the utility of the mass production/flexible specialisation dichotomy itself. Secondly, the inability to account for diverse outcomes to the process of restructuring and to deal with the political implications of this. Finally, the fact that even where instances of flexible specialisation can be identified it does not necessarily have the benefits for labour which they assume.

Potentially Piore and Sabel may have some important insights concerning changes in the organisation of production in certain qualified situations, but these tend to be obscured behind claims that they have identified a new (universal) organising principle to which all industries and forms of work can, or must, gravitate. And on this point the theory of flexible specialisation is unconvincing, incapable as it is of recognising or dealing with the possibility of differences, of unevenness. Hyman makes perhaps the crucial point;

> to pose flexible specialisation as a potential recipe for universal corporate success is to envisage an economy in which there are no losers, only winners...but in a competitive capitalist economy not all contestants can win prizes. If some can gain a competitive edge through flexible specialisation - and if self contained market niches are not universally available - then some will be driven into the abyss (1988: 52-3).

4. JAPANISATION AS POST-FORDISM

Japanese manufacturing techniques have exerted a mesmeric hold over the imagination of many British and North American commentators. The competitive success of Japanese manufacturing industry, often at the

expense of western producers, has prompted this heightened interest. Japan has been described as the quintessential 'post-Fordist' society (eg. Kenney and Florida, 1988: 122). Moreover, the industrial principles which are said to underpin Japanese competitive success, are said to be transferable to other countries (eg. Schonberger, 1982). Kenney and Florida, indeed go even further arguing that Japanese production methods are the new organising principle for industrial production:

> The successful implementation of Japanese work organization indicates that postfordist production is generalizable across quite different national contexts...Far from being unique to the Japanese context, social organization of postfordist production appears to be setting in motion a dramatic transformation of work organisation, industrial structure, and labor relations across much of the landscape of advanced industrial capitalism (Kenney and Florida, 1988: 144-5).

Relatedly, some writers have suggested that, compared to 'Fordist' labour processes, the Japanese approach 'offers a much more humane working environment' (Kaplinsky, 1988: 468)[9]. More specifically for the empirical focus of this study, much has been made of the potential for the 'Japanisation' of British manufacturing (Oliver and Wilkinson, 1988). According to this perspective, Japanese methods have been transferred into Britain through the arrival of inward investors and through

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[9]The view that Japanese work organisation is more humane than that said to prevail in western countries has been advanced from within the flexible specialisation camp and offered as evidence of the 're-emergence of the craft paradigm' (e.g. Piore and Sabel, 1984: 205-208). In the previous section, however, I highlighted also the apparent ambiguity of the Japanese case in the theory of flexible specialisation. For this reason I do not address the pronouncements of Sabel and others on this case. Also, as will become clear, I regard talk of resurgent craftwork as particularly unhelpful in understanding the significance of Japanese work organisation.

'emulation' by existing firms. For some in management circles, Japanese production methods hold out the possibility of arresting the comparatively poor performance of British manufacturing (for example, Parnaby, 1987; Wickens, 1987). This point of view is shared by key government ministers (see Tomaney, 1991).

In what follows, then, the ever-growing debate on Japanese production techniques is addressed in relation to the question of whether it symbolises the alleged radical departure in industrial organisation and whether it presages a trend towards the humanisation of work.

Turning Japanese? Innovative aspects of Japanese production methods

The argument that Japanese production methods signal the end of mass production is particularly difficult to sustain. It seems clear that far from being a manifestation of a resurgent 'craft paradigm' (Piore and Sabel, 1984), Japanese competitive success has turned on the performance of large enterprises practising the production of 'high volume repetitively produced goods' (Schonberger, 1982, emphasis in original). Furthermore, the idea that contemporary restructuring is determined essentially by technical innovation is not supported by the Japanese case. While it is true that Japanese enterprises make use of advanced technology (Japan is the world's largest user of robots) there seems broad agreement that the significance of these methods lies not in the nature of technology but in the way it is used (e.g. Sayer, 1986; Morroni, 1990). As Jurgens observes:

> The Japanese production system is based on three principles: flexibility in utilization of facilities; minimization of quality

> problems as they arise; minimization of production-flow buffers, whether material, manpower or time-buffers. The realization of these principles is not apparently dependent on a specific technology; in fact most experts conclude that the Japanese 'competitive edge' is not based on a specific technology. One of the most important factors is, in fact the intense manpower utilization resulting from the interaction of the above mentioned production principles (1989: 208; cf. Kaplinsky, 1988: 462).

The core of Japanese production management and productivity improvement is generally viewed as arising from just-in-time production and total quality control which are held to challenge some of the assumptions of western orthodoxy in mass production industries, which, it is said have traditionally tended to trade-off volume and quality in ways which led to wasted output and wasted production time (eg. Sayer, 1986). In contrast, Japanese production methods ('Just-in -time' production or kanban) are said to be based around a special concern with the elimination of wasted output and wasted time in production. This is pursued through attempts to build quality control functions into production (rather than testing for faults at the end of a production run) and through attempts to eliminate sources of disruption which lead to lost or unproductive time. The result is a 'smoothing' of the production flow (Schonberger, 1982). In contrast to Western orthodoxy, the activities of the workforce itself are central in these processes. Management literature stresses the extent to which such a system requires a 'skilled' and cooperative workforce (Monden, 1981; Schonberger, 1982). This last feature of the system is the foundation

for claims about the 'progressive' features of Japanese production practices[10].

The emphasis on employee involvement and high motivation levels in management literature has led to the argument that Japanese methods are a 'respect-for-human system where the workers are allowed to display in full their capabilities through active participation in running and improving their own workshops' (Sugimori et al, 1977: 553). Moreover, this is seen to gel with key features of the Japanese industrial relations system:

> Customs such as lifetime employment system, labour unions by companies, little discrimination between shop workers and white-collar staff and chances available to workers for promotion to management positions, have been of great service in promoting the feeling of unity between the company and workers (Sugimori et al, 1977: 553)

This sympathetic view of Japanese work organisation has been advanced vigorously by a group of writers which, for ease of reference, I shall term the Kyoto School (e.g Aoki, 1984, 1987, 1990; Koike, 1984, 1987). Here the kanban (JIT) system is conceptualised as a 'semi-horizontal operational coordination' method (Aoki, 1990), which requires shop level flexibility in adjusting the amount, kinds and timing of in-process products. Also minimal inventories necessitates effective control of low level disruptions such as machinery malfunctions, worker absenteeism, quality defects, and so on, in order minimize their effects on the

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[10]Monden (1981), Sayer (1986), Schonberger (1982) provide more detailed discussion of the principles of 'just-in time' and the extent to which it addresses problems in the operation of 'mass production' processes (see also Tomaney, 1990).

smooth operation of semi-horizontal coordination. This is aided by a form of work organisation in which job demarcations are fluid. Job rotation, for instance, is common with workers becoming 'skilled' in a relatively wide range of jobs. This is an ideal accompaniment to systems such as kanban[11].

Koike argues that shop-floor employees of large firms have 'white collarized skills' and that these form a 'crucial foundation' (1987: 287) of Japanese industrial success. These workers, moreover, 'think of themselves as belonging to the middle class' (1987: 329). Wide ranging on-the-job training supplemented by short, theory-oriented off-the-job instruction, lasting several years is the foundation of this work organisation. Shop-floor workers in large firms, therefore, share with white collar workers the promise of a 'career' with their company (Koike, 1984, 1987).

The existence and role of lifetime employment and seniority (or merit) wage systems (nenko) and company unions are seen as reflecting and

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[11]For instance the assignment of a worker to a set of different kinds of machine - laid out in linear sequence, rather then grouped by function, can save time necessary for the transport and loading of in-process products, as well as in-shop inventories (Aoki, 1990). Equally, the rotation process - or 'learning by doing' (Koike, 1984) - makes the worker familiar with the whole work process involved in the shop - a familiarity not readily obtained when the work process is organised along more Tayloristic lines. The familiarity obtained may be tacit, but is useful in identifying - and in some cases solving - local disruptions. This is termed an 'integrative' system, where routine tasks and tasks related to exceptional circumstances are not specialized and work organisation tends to a team orientation. In large firms this is the foundation of QCs (Koike, 1984).

reinforcing this system of skill formation and worker participation. Lifetime employment motivates both employers and employees to share the costs of investment in this team-oriented human capital. Seniority-related pay and long-term employment guarantees have been developed as devices through which both management and labour can reap returns from their respective investments over time. In order to protect his skill development - the workers to whom these comments apply are invariably men - the worker is seen as having a special interest in the economic situation of the firm: 'Even without any loyalty to the firm, he has to pay attention to the firm's productivity to prevent it from being bested by rivals' (Koike, 1987: 307). Enterprise unions, with their well-known cooperative attitude to management, merely reflect these concerns of the workforce.

The arguments of the Kyoto School reflect the dominant view of Japanese work organisation in the West. However, significantly for the concerns of this thesis, these arguments have taken up by critics of Taylorism (see: Kaplinsky, 1988; Kenney and Florida, 1988; cf. Sayer, 1986). In particular, the evidence of the Kyoto School has been contrasted with a less celebratory view of Japanese production methods which emphasises that continuous flow and constant rationalisation are based on the extreme intensification of work. For Dohse et al (1985) the existence of company unionism is indicative of the untrammelled power obtained by Japanese management in the workplace which results in continual rationalisation of production - often through QCs and the like - using workers' own knowledge. They term this process 'Toyotism' but suggest that it 'is simply the practice of the

organizational principles of Fordism under the conditions in which management prerogatives are largely unlimited' (1985: 141) and which were the result of defeats inflicted on the independent union movement, which had posed a radical challenge to Japanese capital and state power following the end of the Second World War.

Kenney and Florida present perhaps the boldest critique of what they term the 'super-exploitation thesis', to present the Japanese case as an example (or the example) of post-Fordism and as more humane than Taylorism. Indeed they advocate such methods to American workers. Adopting the 'Kyoto' view of the Japanese industrial system, they view lifetime employment guarantees and nenko, as part of the 'unwritten terms' of a 'class accord' and the 'white collarization' of shop-floor work, participation in 'voluntary' quality circles and the rationalisation of production, as the outcome of successful struggles by company unions. They conclude that, in large firms, the strategies of company unions have rendered capital dependent on labour to an unprecedented degree. The success of this strategy is reflected in the relative absence of industrial conflict over the issue of technical change in Japanese enterprises.

However, this case for company unionism and the attendant benefits for Japanese workers is not persuasive. In fact, the limited role played by company unions in the production process is stressed by Toshiro Shirai:

> Generally speaking, while labour unions in Japan express the primary concern over the wages, they pay little attention to the amount of labour supplied in return for the wages...(the) union function is very feeble or rarely seen in such areas as

> the regulation of production schedules, manning levels, standard output quotas, speeds of production and so forth. At least, unions scarcely pick up these issues as the agenda for the formal collective bargaining (Shirai, 1968; quoted in Kumazawa and Yamada, 1988: 117).

To the extent that negotiations occur they do so informally. Moreover, when the 'congruence of union and management hierarchies' (Deutschmann, 1987: 483) is taken into account, it is easy to accept the argument that negotiations are dominated by the concerns of management, with the company union's role limited to 'preparing acceptance for the new technology and an atmosphere of smooth cooperation for its implementation' (Deutschmann 1987: 470). For Deutschmann, Japanese unions have failed to act as a 'countervailing power' to the interests of management at every level[12]. Indeed, it was precisely the absence of limits on management's ability to rationalise production and intensify work processes, which was the foundation of rapid productivity increases after 1960. Moreover, it was on this foundation of rising productivity that long term employment guarantees were introduced. But far from being part of the 'unwritten terms' of the class accord, 'lifetime' employment has always been a gift of management and more often than not a response to endemic labour

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[12]Kawanishi (1986: 152) goes so far as to describe enterprise unions as an 'auxiliary instrument' of personnel administration in large firms: 'Thus the labour-management consultation system is, under the good name of worker's participation, an instrument which converts the union into an auxiliary instrument of management and by the union, for the increase of productivity. Under such labour-management relations, the workshop organisation of a union becomes an organisation which, under the hegemony of management, mobilises its members to increase productivity (ibid).

shortages[13]. Moreover, lifetime employment has been preserved for core workers in large firms only through the dualistic nature of the Japanese production system and labour market[14].

It is clear that large firms have avoided large scale employment problems mainly through 'externalising' the consequences of technical change and rationalisation. Deutschmann (1987) examined why rapid technical change took place so smoothly in large enterprises in the 1970s and concludes that work previously done by contractors was 'put in' in order to guarantee employment for core workers. The 'success' of enterprise unions, therefore, needs to be measured against this dualism and the discrimination along lines of age, gender and ethnicity which it involves.

The company orientation of unions also limits the value of the 'skills' which are seen as central to nenko practices. This means that far from being indicative of worker security and company dependence, they are precisely the opposite. The company specific nature of the skills means

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[13]As Tokunaga observes: '...the lifetime employment system was not prescribed in collective agreements, but existed only by custom: thus, if a management considered a situation serious, it could dismiss even regular employees (honko)' (1983: 316; for a similar interpretation see Kumuzawa and Yamuda, 1988: 123).

[14]Kenney and Florida acknowledge the existence of this dualism but, ultimately, view the relationship between large firms and smaller ones not as one dominated by power inequities, but as one aspect of the system's effciency. The relationship between these firms is explained in terms of sharing the burden of innovation. However, they themselves recognise that the 'white-collar' skills which they laud barely extend outside the large firms (cf. Koike, 1987).

there are no nation-wide social arrangements against which worker's skills can be evaluated across the dividing lines of firms organised, as they are, in a powerful hierarchy (Kumuzawa and Yamada, 1988). Thus, far from guaranteeing the economic security of workers the Japanese industrial relations system actually limits it. As Deutschmann (1987) observes, the lack of vocational labour markets denies 'exit' options for those employees not able or willing to comply with rationalisation measures. This has two implications. Firstly, it means firms can safely invest in 'human capital' with a guarantee of good returns. Secondly, it means workers must comply with rationalisation measures to guarantee the prosperity of 'their' firm. The company unions themselves are rendered more committed to the competitive struggle of the firm: in fact in a real material sense the interest of workers, unions and companies are at one[15].

Ultimately Kenney and Florida's case for Japanisation as a humane, 'post-Fordist' form of work organisation, rests on their rejection of the

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[15]Paradoxically, this situation also explains why examples of worker militancy in post-war Japan have usually been associated with the issue of lay-offs. The major strikes at Nissan and Toyota in the early 1950s - the defeat of which was a prelude to the development of the industrial relations system - concerned lay-offs (Cusumano, 1985). The famous strike of the traditionally militant Mitsuii-Miike coalminers in 1959-60, also concerned this issue, and is usually regarded as the last attempt to halt the rationalisation offensive which underlay the economic growth of the 1960s (Muto, 1985, 1986; Tokunaga, 1983). The mass redundancies which accompanied the privatisation and dimemberment of Japan National Railways led to violent protests in the 1980s. This has been taken as evidence of the increasing fragility of the nenko system (Itoh, 1990: 18-19).

view that intensification is built into the system. In a key passage they argue:

> The objective of the JIT system is to increase productivity not through super-exploitation of labor but rather through increased technological efficiency, heightened utilization of equipment, minimal scrappage or rework, decreased inventory and higher quality. It thus increases the 'value' extracted in production, decreases materials consumed per unit and minimizes circulation time, making the actual production process much more efficient (1985: 136).

This is a neat argument but one which fails to address the main point of the critics that the search for precisely these time economies in the production process is premised upon and contributes to a more intensive use of labour. The pursuit of stockless production is based upon the elimination of all wasteful motions in the performance of work: 'The net result, when combined with job flexibility and upwardly mobile task allocation levels is the continuous reduction of labour' (Turnbull, 1987: 11). The continued reduction of batch sizes allows tighter control of the production process and work allocation, greater utilisation of residual labour and the standardisation of job tasks. This is the basis of Schonberger's rejection of the idea that JIT is more 'humanistic' than 'Taylorism': 'but the Japanese out-Taylor us all - including putting Taylor to good use in QC circles or small group improvement activities' (1982: 193). The continued removal of in-process buffers intensifies work even further[16]. The delegation of quality control responsibilities

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[16]'The Japanese no longer accept the buffer principle. Instead of adding buffer stocks at the points of irregularity, Japanese managers expose the workforce to the consequences. The response is that workers and foremen rally to root out the causes of irregularity. To ignore it is to face the consequences of work stoppages. The Japanese principle of exposing the workers to the consequences of production irregularities

(Footnote Continued)

adds further to work burdens. However, the devolution of certain previously specialised tasks to the shop-floor is generally more limited than implied by terms such as 'intellectual skills':

> Some of them may be probably highly routinized so that other workers can perform them without any real training. Furthermore, it is not unusual that frequent mobility in a workshop arises because of the management policy of operating with minimal manning levels. What can safely be said is only that 'skill' scarcely emerges as a source of workers' autonomous power to regulate how and how much workers should work (Kumuzawa and Yamada, 1988: 124; cf. also the discussion of skills under flexible specialisation in the previous section).

The case, in my view, for Japanese work methods as a form of 'super-exploitation' remains strong. Moreover, the version of Japanese work methods outlined here would appear to resolve the discrepancy between those accounts which emphasise features such as 'learning-by doing' and so on (eg Koike passim; Sayer, 1986), and those accounts which stress intensification: intensification can be seen as the outcome of efforts to engage the participation of the workforce in the rationalisation effort[17].

(Footnote Continued)
is not applied passively. In the Toyota kanban system, for example, each time that workers succeed in correcting the causes of recent irregularity (machine jamming, cantankerous holding devices, etc.,) the managers remove still more buffer stock. The workers are never allowed to settle into a comfortable pattern; or rather, the pattern becomes one of continually perfecting the production process' (Schonberger, 1982: 32, emphasis in original; cf. also the comments of Abernathy et al, 1983: 176).

[17]Dohse et al (1985) in their attempt to stress the negative aspects of Japanese work methods and the extent to which they are founded on the defeats suffered by Japanese labour, however, are in danger of understating their novelty when they argue that they are simply a form of uninhibited Fordism. Systems such as kanban represent a real innovation as far as the operation of mass production industries
(Footnote Continued)

The notion of Japanisation as post-Fordism is based crucially on claims made for the transferability of these methods. Jurgens discusses the transferability of these methods in terms of a 'highly uneven selection pattern' (1989: 217). Western firms have taken up job rotation methods and have begun the pursuit of zero defects, zero buffers and so on. The introduction of production teams and the decentralisation of responsibilities seem part of broader international trend. However, these processes cannot be taken as evidence of 'Japanisation' because they have a more limited range of functions than in Japan. Also the mobilisation of problem-solving among shop-floor workers has proceeded at a slow pace. According to Jurgens the limited nature of worker involvement in the west reflects the fact that:

> The mechanisms for assuring conformity and regulating attitudes seem to be too embodied in Japanese social structures and their conditional factors for their transfer to be systematically developed (1989: 218).

(Footnote Continued)
is concerned. As suggested earlier, in principle, JIT addresses some key problems in the orthodox operation of mass production processes which concern the elimination of idle time. In particular, systems such as kanban address the key question of line balancing from a different set of premises to those of Western orthodoxy. In Western mass production contexts line balancing tends to be a technical exercise concerned with ensuring proportional labour times for fixed labour assignments. This is a difficult task to achieve and contributes to the emergence of gaps in the work process. The Japanese approach of moving workers around the shop is designed very largely to address this problem by either moving workers to trouble spots or moving them away when lines are running smoothly. This allows shops to operate with less workers. Also it ensures a high proportion of time worked to time attended. Schonberger (1982: 140) expresses this with characteristic candour: 'Good line balancing means full utilization of workers: keep them busy'.

Nevertheless, claims continue to be made that a new organising principle for industrial production is emerging and I return to this issue in the next chapter in the light of the specific claims for the 'Japanisation of British industry'.

Despite various confused attempts to mobilise 'Japanisation' as supporting evidence for flexible specialisation, it seems that these methods do not suggest the 'end of mass production'. Rather they suggest an innovation within mass production industry and its development into a more continuous process (Schonberger, 1982: 104-5; also Shaiken et al, 1986: 176). JIT and its supports can be seen as a variant of the integrated mass production process to which I drew attention at the end of the previous section. In the Japanese case, though, the central emphasis is on shop design and intensive utilisation labour rather than a particular technology.

The absence of a countervailing power to management is central to the operation of this system. As Kumuzawa and Yamada argue:

> 'The set of popularly perceived productivity advantages of so-called Japanese-style management largely rest on management's unchallenged power to reorganize the existing production process more efficiently (1988: 102).

Therefore the argument, advanced by Kaplinsky and by Kenney and Florida, that the adoption of such working methods will guarantee a new, post-Fordist, humanisation of work is implausible. There is an overwhelming case for viewing JIT - and the forms of work organisation with which it is associated - as a form of work intensification.

5. NEW PRODUCTION CONCEPTS: THE GERMAN DEBATES

The notion that key aspects of manufacturing industry are seeing the emergence of 'new production concepts' which raise the possibility of reskilling and, more importantly, the possibility of a new bargain between capital and labour, is associated with the work of Horst Kern and Michael Schumann and their colleagues at the Soziologisches Forschungsinstitut (SOFI) in Gottingen. The possibility, however, that the new forms of technology and work organisation offer positive signs for organised labour, in fact, has been more widely heralded (see, for instance, Streeck, 1987; Sorge and Streeck, 1988, and other work from the Wissenschaftszentrum, WZB, Berlin). Debates about the value of this conception of contemporary workplace restructuring in manufacturing have dominated European sociology, in much the way the debate about flexible specialisation has dominated Anglo-American discussions (see Campbell, 1989, for a review). While superficially similar to the concept of flexible specialisation, the 'new production concepts' idea is significantly different and, in my view, warrants separate discussion[18].

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[18]The few English language discussions of Kern and Schumann (1984) have tended to present their work as another variant of flexible specialisation. While this is partially justified (Kern is now collaborating with Sabel) this approach raises the danger of ignoring the interesting debate which has surrounded the reception of their work. My own view is that, despite its limitations, the work of Kern and Schumann, in crucial respects, is superior to that of Piore and Sabel. I discuss the key differences below.

In particular, and in contrast to the theory of 'flexible specialisation', the theory of 'new production concepts' is grounded in the recent experience of the (former) West German economy (hereafter referred to as 'Germany') and the development of the 'high-wage/high-productivity coalition'. This raises the question of the general applicability of this model and the relevance of discussing it in the light of the concerns of this chapter and the thesis more generally. There are two good reasons for including a discussion of this debate in this chapter. First, there have been attempts to locate the emergence of new production concepts outside Germany (see Kern and Schumann, 1989) and to explain the poor performance of other economies (eg. the UK) in terms of the absence of 'new production concepts' (eg. Lane, 1988). The implication of these discussions is that the insights of Kern and Schumann could be applied to situations outside Germany. Second, the debate surrounding new production concepts offers some insights of a general nature into the transformations occurring in process and mass production industries.

The End of the Division of Labour?

> The end of the division of labour: that is what development in an important part of industrial production could lead to under the influence of the new production concepts (Kern and Schumann, 1987: 163)

Kern and Schumann's identification of 'new production concepts' around 1984 was a remarkable change from their previous position which had identified the progressive 'polarisation of skills' at the plant level (see Campbell, 1989). For Kern and Schumann the new experiments in work

organisation which had gestated in the 1970s and which began to bear fruit in the 1980s represent a radical break with Taylorism. Skilled work, 'which during a process stretching over many years has been forced into secondary sectors' is seen as returning 'to the primary production area' (Schumann, 1987: 46).

The re-emergence of skilled work and an associated valorisation of labour is ascribed to several reasons: because the fully automated factory is seen as a false hope; because technical change and the nature of markets requires more flexibility from workers; because the 'old' methods of securing control over the workforce have lost their credibility, and; because of a general demand for more satisfying forms of work (eg. Schumann, 1987: 57). More generally, Streeck, reviewing the trend toward flexible industrial relations argues that the initiatives put forward by management are designed:

> to find ways of managing an unprecedented degree of economic uncertainty deriving from a need for continuous rapid adjustment to a market environment that seems to have become permanently more turbulent than in the past. Coping with this uncertainty seems to require an increasingly close (re-)integration of industrial relations and industrial strategy in the context of a comprehensive manufacturing policy (1987: 285, emphasis in original).

Kern and Schumann's thesis is based on research into changes occurring in three 'core' areas of German manufacturing: motor vehicles, machine tools and chemicals (Kern and Schumann, 1984a, 1987; Schumann, 1990). While the concrete forms of work organisation differ in each case, they feel able to offer some claims about developments which are common to all. A new 'consciousness of the qualitative significance of human work performance' (Kern and Schumann, 1987:

160) arises principally with the trend towards flexible forms of automation. Where automation is occurring a 'holistic principle of labour skill appropriation' is emerging because the introduction of new technology 'frequently allows - or even demands - the tailoring of jobs for higher qualifications as well as broader responsibilities or at least a less detailed division of labour' (Kern and Schumann, 1984b: 59).

This general trend is seen to be expressed concretely in each of the industries studied. In the car industry, Kern and Schumann (1984, 1987) identified initially the emergence of a vocational 'production mechanic' associated with intensive mechanisation. Follow up work though suggests that the trend to new production concepts takes two principle forms. In 'high-tech areas' (eg. stamping and machining shops) the idea of 'integrated work' has gained general acceptance:

> The issue at stake is not simply the future localization of maintenance but also that of quality control, machine programming, and the regulating of the work flow. The decisive factor for the broad diffusion of the idea of integrated work roles is the conviction that it is exactly the polyvalent production worker - polyvalent in the sense that he is able to carry out maintenance operations in addition to his direct functions - who can guarantee maximum utilization of costly machinery. Killing two birds with one stone, one hopes to stop the expansion of maintenance costs as well (Schumann, 1990: 3).

In assembly areas, where the obstacles to automation are much greater, it is possible to identify only 'hesitant steps to job enrichment' (ibid) which consist of more flexible work cycles, de-coupling the assembly line, teamworking and so on.

In the machine tool industry the widespread introduction of CNC equipment is said to be resulting also in a demand for higher skills,

with skilled labour regarded as a 'positive planning concept' and no longer as a 'necessary evil' (Kern and Schumann, 1987: 161; also Lappe, 1988; Mickler, 1989). Here the increase in skilled work is not purely a product of technical change but a result of the decision to combine control and programming functions. Within the chemical industry the pursuit of full automation may continue the trend towards 'the professionalisation of production work' (Kern and Schumann, 1984: 161), although, again, follow up studies suggest the enthusiasm for work reform is here less than in the other two industries and is moving at a slower rate of progress (Schumann, 1990; cf. Cavestro, 1989, for broadly supporting French evidence on machine tools and chemicals)

Despite differences which are the product of sectoral specificities a generally increased demand for a new type of skilled worker arises from the process of contemporary restructuring. There is a common factor underlying this new skilled work: 'What is required is a man who is manually gifted and theoretically talented, able to diagnose and to act effectively', one who 'must be in a position to compensate for weaknesses in the technical system by practical action' (Schumann, 1987: 47-48). Schumann has used the generic term 'systems controller' to capture the nature of the new skilled work emerging in manufacturing.

> 'The worker supports technical autonomy and intervenes if machinery does not function at an optimal level or if breakdowns occur. His actions are subsidiary. In the case of deviation from the optimum or failures the worker may take direct control of the process, always with the aim then, to give control back to the machinery...If the technical system should work perfectly, the main responsibility of a systems' controller is to check and to service the machinery. He himself does a perfect job if he succeeds to anticipate

> deviations and breakdowns in the technical system and proceeds to initiate prevention (Schumann, 1990: 19).

In short, the requalification of the workforce is necessary to guarantee the smooth operation of increasingly complex and costly items of plant.

In a number of respects similarities clearly exist between 'new production concepts' and flexible specialisation. However, it is worth also stressing the important differences. Firstly, in their earlier work at least, Kern and Schumann are less keen to make claims for 'paradigm' change of the kind advanced by Piore and Sabel. To an extent they emphasise continuities as well as changes. In particular, they argue that the principle of capitalist rationalisation remains unaltered - the improved utilisation of machinery - but the means to achieving this end is being altered. Arising from this, they offer a production led account of restructuring rather than a market led one. Secondly, they reject the idea that changes in manufacturing signify the 're-emergence of craft-work'. The new skilled worker is 'less materials-oriented and more concerned with technical and organizational procedures', the new worker is instead 'a kind of scout: sensitive to breakdowns, with quick reactions and the ability to improvise and take preventive (sic) action' (Kern and Schumann, 1989: 94). Finally, Kern and Schumann recognise that while some workers benefit from the emergence of new skilled work, others lose out. They identify three broad groups, the self-evident winners; the tolerators of rationalisation whose positions are protected by employment laws but who lack the

basis for moving into the new jobs, and; the losers who are expelled from employment or who never actually obtain it[19].

Notwithstanding the possibility of a downside to these developments, 'new production concepts' are said by their supporters to offer an unprecedented opportunity for labour to strike a new bargain with capital. The fact that the new rationalisation strategies require the active participation of labour in production potentially gives labour a new strength in the workplace. Unions need to work with the grain of technical change. Such a response by trade unions would necessitate their commitment to decentralised bargaining structures (in the German case) and a recognition that interest representation by unions would be closely integrated with the management of production and a concern for productivity. Moreover, unions would need to recognise the need for and institute greater pay differentials, more bonus systems and share ownership by workers. These change are necessary to secure unions a role in the new production system (eg. Streeck, 1987). Management too, though, according to this view, must begin a reassessment of its attitudes toward labour:

> Higher productivity cannot be attained under the present conditions without a more considerate, 'enlightened' treatment

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[19]In fact one consequence of these developments in skills and technology is to make it even more difficult for the unemployed to enter the labour market. To this extent the problems inherent in the new developments within plants are 'externalised' (Kern and Schumann, 1989: 96; cf. the discussion of Japanisation above). Altmann and Dull (1990: 112) suggest, however, that while the notion of 'new production concepts' has been taken up with enthusiasm by sections of German management, the issue of labour market segmentation has largely been ignored.

> of human labour - that is something capital too must learn (Kern and Schumann, 1987: 162).

Increasingly as sections of management come to see the value of the new production concepts, labour's strategy should be to make alliance with the 'modernisers' in their battle with the 'traditionalists' who are stuck in outmoded, Taylorist lines of thought. While some writers (eg. Streeck) see a momentous struggle with the future survival of the labour movement at stake should the battle be lost, Kern and Schumann tend to give the impression that the future is foreclosed with few choices available, and a future pattern of development which is already determined.

Limits to new production concepts

The first area of controversy surrounding the existence or not of 'new production concepts' concerns the extent of the putative experiments. Kern and Schumann have been accused of 'a lack of empirical data in supporting their far-reaching conclusions' (Wiedermayer, 1989: 63). As Wiedermayer notes: 'the manner of their presentation conveys the impression of a virtually inexorable development process (not only in some core sectors but in the economy as a whole)' (1989: 63). Altmann and Dull (1990) suggest that the 'new production concepts', as described by Kern and Schumann, amount to only limited, isolated experiments not an emerging trend. Kern and Schumann at times have given the impression that a brave new world is all but assured, while at other times they have been more cautious in their pronouncements.

A further point made by sceptics concerns Kern and Schumann's focus on the 'core' sectors, as this tends to ignore the fact that in other sectors alternative rationalisation patterns may be dominant. Moreover, even within their restricted choice of sectors, Kern and Schumann have been accused of emphasising, in the case of the car industry, trends in highly automated areas (where tendencies toward a more skilled workforce are more evident) while having less to say about areas like final assembly where the obstacles to automation are great and the evidence for radical changes in work organisation less strong (Berggren, 1989)[20].

The discussion which follows concentrates on the debate which surrounds the key features of restructuring in the 'core' sectors where the evidence for new production concepts is said to be strongest. The first question concerns the nature of the new skilled work which is emerging. Critics of 'new production concepts' make three related points. First they point to the difficulty of generalising about the impact of technical change - even in its most advanced forms (cf. the discussion of flexible specialisation). Also, they suggest that where production workers are gaining new skills these tend to be of a more limited kind than that suggested by Kern and Schumann. Finally, the critics point out that even 'enskilled' work processes can be subject to

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[20]Kern and Schumann (1987) do note the absence of 'new production concepts' in 'old' industrial sectors such as shipbuilding, steelmaking and coalmining. The sectors, they argue, are distinguished by a simple struggle for survival and descending position in the economic hierarchy. This claim has obvious implications for this thesis which are addressed in chapters Four and Six and are appraised in the conclusion.

high levels of managerial control and that this has implications for other important issues such as work burdens. These issues are highlighted by an examination of critical research in two important areas: robotisation in key areas of the production process and in the emergence of team-working - the two often being closely related phenomena.

One study of the introduction of robots in three different car plants owned by separate firms concluded that general prognostications were difficult because of the impossibility of assessing the consequences of new technology independently of the particular circumstances under which it is implemented. New technology, it is argued, may be implemented within a 'traditional' division of labour as well as within relatively autonomous work groups. This posed the question of who were the winners and who were the losers in the rationalisation process, and prompted the observation that new technology creates new conflicts of interest between work groups rather than harmonious new production concepts (Windolf, 1985).

Malsch et al (1984) have studied the introduction of robots into the German car industry, largely in relation to spot welding. They argue that for those who retained their jobs after automation the range of skills involved the addition of 'small tasks' such as the preparation of work materials, care and maintenance of electrodes in welding guns, or quality control tasks, the effect of which was to eliminate certain 'indirect' tasks, but 'there is no basic change in the unskilled character of the work' (Malsch et al, 1984: 40). Robotisation, due to its

complexity and propensity to technical failure, does lead to an increased demand for for qualified electricians and electrical engineers (engaged in trouble shooting and monitoring activities akin to those in process industries) so that the average skill profile of the plant increases. To an extent there is a shift, associated with robotisation to a more 'autonomous, comprehensive automation worker' as opposed to 'a drilled, segmented one' (Malsch et al, 1984: 43). However, this is a limited innovation rather than a radical break because little control over the work process has been ceded. The new 'comprehensive' worker they argue is subject to 'comprehensive control', made possible by the widespread use of information technology based on computer-integrated control of production and personnel information systems.

This point is reiterated by Dankbaar's study of team-working in the (West) German car industry. The use of modular production for certain forms of off-line assembly work, for instance, allows longer work cycles for the completion of sub-assemblies, than does a moving assembly line, and this can be taken as evidence of work humanisation. But the use of AGVs (automatic guided vehicles) is double-edged because of the possibilities for increased performance control to which they give rise:

> The computer knows the standard times for the various operations that have to be carried out in every station on every piece of work and it would be easy to signify each station (eg. by a light switching on if it is taking more than standard time (1988b)[21].

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[21]A brief reference to the Swedish example is interesting here, because of the degree to which it has inspired German restructuring (see Schumann, 1990). For instance, the much lauded 'departure from the assembly line' represented by 'dock assembly' at Volvo's experimental
(Footnote Continued)

It is noteworthy that in the particular case studied by Dankbaar the works council successfully resisted the attempt to use AGV technology to increase control over individual performance. However, the potentiality is clear and is ignored by the optimists: 'skilled' work may be integrated into the machine system.

This is not to impute a crude 'control imperative' to management. It is, instead, a recognition that capital intensification is requiring new efforts to increase machine utilisation. Increased use of monitoring technologies reflects this broader imperative rather than a simple desire to control the workforce. The heightened concern with machine utilisation, however, is often related by the critical research to the process of intensification - a process facilitated by the assignment of extra tasks to production workers. This is exemplified in the pronouncements of management in relation to team-working - usually taken as the ultimate expression of humanisation. Thus according to V Haas of GM, Austria, in relation to that company's most advanced experiments:

> Generally stated, each of the individual departments named has its own personnel that can be divided with with respect to labour deployment into active time and idle or waiting time. This is mainly caused by more or less rigid departmental

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(Footnote Continued)
Kalmar plant (e.g. Lindholm and Norstedt, 1975; Aguren et al, 1984), is now regarded as only a limited innovation. The carriers which move part-completed work into docks for groups to perform a range of tasks are controlled centrally by a computer with a uniform work pace throughout the plant (Berggren, 1989: 181). Many of the innovations associated with flexible automation at Volvo in fact give rise to increased possibilites for central monitoring (see Auer, 1985; Gronblad, 1987). Thus, Breggren's (1989: 193) description 'the dominant trend' in the Swedish motor industry as the emergence of 'flexible Taylorism' seems accurate (see Tomaney, 1990).

> boundaries in the sense of a division of labour and areas of responsibility. The team concept has this as a starting point. The concept leads to production teams, that means that all those directly participating are 'in one boat', and all can do all of the tasks within the area of responsibility of the team - quality, production, volume and capacity utilisation. The joining together of previously separated individual areas of responsibility in a team opens up possibilities for reducing the sum of time lost. Or, expressed differently, to achieve the highest possible ratio of time worked within the working time of the individual employee. The ideal leads automatically to the formation of a team based on different areas of responsibility (quoted in Jurgens et al, 1988: 269; c.f. similar comments made by J Heizmann of Opel, 1983: 113, in relation to team-working with robots at that firm's Ingolstadt plant).

This intensification of the work process arising from the new forms of work organisation is a feature which is stressed in the critical accounts. The work of Kern and Schumann, however, is characterised by varying degrees of ambivalence or silence on the subject (cf. also Lane, 1988). Yet, as Altmann and Dull suggest the new technologies in which Kern and Schumann seem to place their faith do not themselves lead to reduced work burdens 'but rather to a shift of stress factors' (1990: 120). This discussion reveals perhaps one important limitation of the German high-wage/high-productivity coalition from the workers' viewpoint.

A second aspect of the conflict over intensification relates to the present controversy surrounding weekend working and flexible shift patterns. Arising partly as a result of the success of the metalworkers union, IG Metall, in winning a reduction of the working week in the metalworking industry to 35 hours in 1984, management's expressed desire for weekend working reflects a wish to raise levels of utilisation of expensive capital equipment: 'The traditional form of time

arrangement could not easily be applied to the new constellation of production and time economy within industry' (Schudlich, 1989: 32)[22]. While writers such as Streeck suggest that employers have stolen a march on unions where the question of flexible shift patterns is concerned by responding to the real desires of working people, the conflict concerns fundamentally different conceptions of the problem. As Hinrichs and Wiesenthal observed:

> Whilst the employee preferences for non-standardised working times expressed an interest in self-determined organization of life,...the employer strategy of creating flexible working times represents precisely this kind of access to the 'Lebensraum' of the employees. The proposed changes aim at the exploitation of time spheres hitherto regarded as 'private',...it is precisely those time spheres which are to be regained for working use (1984: 287, translated in Schudlich, 1989: 35-6)

Debates about working time in the German car industry are inextricably linked to the issue of the relocation of investment to low cost countries. High unit wage costs are propelling both the attempt to utilise labour more efficiently and to seek out locations for low cost production. Among other things this use of the 'periphery' to undermine the 'centre' (i.e. high wages and reduced hours) illustrates the dangers of a focus on developments in 'core sectors' as precursors of more widespread change and the uneven and contradictory application of the

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[22]'The interest of management in implementing more flexible working times is explicitly explained as a question of the 'economic necessity' to avoid 'idle times' of employees and extra payments for overtime work. Flexible working times would contribute to overcoming the 'counterproductive effects of rigid working time arrangements', make it easier to cover peaks in work volume and increase the utilisation of plant. With working hours no longer linked to operating times, cost saving regulation of the use of labour would be possible' (Schudlich, 1989: 35)

the new production concepts themselves (c.f. the discussion of flexible specialisation in section three)[23].

The contribution of the German debate

The work of Kern and Schumann is provocative and its main benefit has been in terms of the debate it has inspired. The idea of new production concepts has been subject to telling criticism. The argument that sweeping changes are transforming the 'core' sectors of the German economy needs to be treated with caution. However, the argument that rather less dramatic, more piecemeal and contradictory changes are occurring in those industries is sustainable. Kern and Schumann's focus on new forms of work organisation overstates their novelty. This overstatement can be explained by their attempt to draw a contrast between new production concepts and the previous pattern of skill

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[23]For instance, VW's decision to take a controlling interest in SEAT, for the production small cars has been explained largely (although not exclusively) in terms of its access to low labour costs in Spain (eg. Financial Times, 22.2.89). This seems also to be an important reason behind VW's decision to situate its joint venture with Ford, for the production of a 'people carrier', in Portugal (Financial Times, 22.5.91. Other German car producers such as Opel have used threats to transfer investment elsewhere (eg. Antwerp) to secure IGM's agreement to Saturday working in German plants (Financial Times, 23.8.89). The decentralisation of decisionmaking over the concrete implementation of the 35 hour week led to the controversial decision by the local works council to sanction weekend working at BMW's Regensburg plant without IGM centrally being aware (Financial Times, 8.8.89). The issue of weekend working is one of the most divisive issues facing the German union movement. Unions such as IG Chemie (chemical workers) take a largely sympathetic attitude to requests for weekend working, whereas IG Druck und Papier (printworkers) have tended to be more militant in their opposition. IGM have suffered some notable recent defeats on the issue which seem to have forced a more pragmatic attitude.

polarisation. This perspective on the past, however, leaves the impression of a German industry that had been thoroughly imbued with Taylorism. In reality, though, German industry was relatively less influenced by Taylorism than other European countries (cf. Lane, 1988). In fact craft types of labour endured to a greater extent that elsewhere - a product, to a large degree, of the industrial strengths of the German economy in high value-added sectors. Thus, the trajectory of technical change should be located within the specificities of the German economy (see also Chapter Three). Even within these somewhat favourable circumstances, the critical accounts suggest the extent to which the process of workplace change continues to be negotiated and contested.

5. REGULATION THEORY AND THE CRISIS OF FORDISM

French 'regulation theory' has been dedicated to the development of a set of concepts designed to make sense of the specificities of the particular periods of capitalist development. According to this position, while at the most abstract level there remain certain invariant relations of capitalist production, the concrete relations of production, consumption and regulation differ historically, and in line with broad transformations in technology, the wage relation, the consumption norm and forms of economic regulation[24]. This approach accords a centrality

[24]Useful accounts which identify the geneology of this approach and chart some its internal differences are Barbrook (1990) and Dunford (1990).

to transformations in the labour process in the account of change. In what follows I concentrate on the implications of the regulation approach for the labour process, rather than the theory in general.

The crisis of Fordism and the transformation of the labour process

> What we are witnessing, then, is an attempt to make sweeping changes to what Marx called 'factory legislation', an expression he used in discussing changes in the wage labor relation that accompanied a major technological and economic change (Coriat, 1984: 45).

Regulationists have sought to theorise the development of the labour process in terms of the imperatives placed upon production by the process of valorisation. The saving of labour is of central importance in an economy based on production for profit. The concrete forms of the labour process are seen in terms of Marx's characterisation of the movement from simple cooperation, through manufacture to large-scale industry (or machinofacture). Using this approach the mechanisation of the labour process signals a relative shift from the production of absolute surplus value to relative surplus value, concomitant with the real subordination of labour. The continued transformation of the labour process reflected the attempt to reduce, what Marx termed, the 'pores' in the working day - that is, losses of time which result from the way the labour process is organised and the capacity (and will) of workers to sustain the pace of work. The onus placed on capital to secure these time economies historically has propelled the continued intensification of the work process, which is obtained 'chiefly by subordinating labour power to the continuous and uniform movement of

the machine system and increasing the system's speed of operation' (Aglietta, 1979: 51).

For Aglietta (1979) Fordism represents the ultimate expression of this inherent tendency in the capitalist production process. Fordism 'deepened' Taylorism in the labour process through the integration of the fragmented labour process through the principle of flow production and by fixing workers to jobs whose positions were determined by the configuration of the machine system. With flow production the individual worker lost all control over work rhythm. Fordism is therefore the mechanical expression of Taylorism. At the 'heart' of Fordism is the 'semi-automatic assembly line' used especially in the assembly of goods for mass consumption although, according to Aglietta, it was subsequently extended upstream to the production of standardised intermediate components for the manufacture of the means of consumption. The widespread diffusion of Fordist production methods (and the productivity improvements to which they gave rise) were the foundation of post-war economic growth.

However, it is the exhaustion of Taylorist/Fordist methods which underlies the present crisis. The improvement in productivity characteristic of the post-war period proved difficult to sustain from the end of the 1960s. There were both external (market-related) and internal limits to the further development of Fordist principles[25]. The

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[25]The 'external' limits concern changes in the conditions or
(Footnote Continued)

internal limits, according to Aglietta were threefold. First there was an increase in the 'balance delay time', that is, delays caused by imbalances on the assembly line. This reflects the impossibility of distributing work time equally and leads to idle periods on the part of workers with shorter cycles (see also Palloix, 1976: 51). Second the uniformity of effort required by assembly line pacing caused fatigue amongst workers which had consequences for absenteeism, accident rates and even work quality. Finally, the collectivisation of work achieved by the assembly line abolished 'any perceptible tie between the collective output of the work force and the expenditure of energy by the individual worker' (Aglietta, 1979: 121). Managements responded to this latter problem with 'complicated plans' designed 'to involve the participation of workers in apparent productivity gains' (ibid)[26].

(Footnote Continued)
realisation of the economic surplus. According to Aglietta, 'The far-reaching transformations of the technical division of labour that the semi-automatic assembly line permits give an enormous boost to productive capacity and consequently demand social conditions specific to the mass circulation of commodities at a rapidly increasing rate' (1979: 119). These conditions were established, in the USA, with the emergence a 'mass consumption norm' in the post-war period. Further productivity gains are pursued through increased fragmentation of tasks and further mechanisation. The technical rigidity of the machine system, however, means there are dangers in this strategy. 'This way of raising productivity consequently makes investment propel investment on an even large scale, while markets must be expanded at whatever cost, with increasing risks of devalorization of the fixed capital thus immobilized' (Aglietta, 1979: 119; see Clarke 1988a&b for a critique of this view).

[26]These productivity bargains also served a wider purpose ensuring a close relation between wage rises and productivity improvements in the 'leading sectors' which underpinned the extension of the 'mass consumption norm'. In the USA 'the canalization of the economic class struggle by collective bargaining' (Aglietta, 1979: 190) reflected the emergence of highly centralized bargaining structures regulated by the state through the National Labor Relations Board (see Boyer, 1984, for a similar account of the French 'post-war compromise').

For Aglietta the limits of Fordism were revealed by the heightened level of class struggle from the end of the 1960s. In the USA this involved problems of labour control and the rejection, by workforces, of centrally agreed wage rises. In the early work of the regulation approach class conflict is given an important explanatory role in the emergence of the crisis of Fordism and as the stimulus to the reorganisation of production. Coriat, for instance, traces the origin of the crisis in France to the period 1966-74. The central feature of this period 'is the relative instability of capitalist industry based on repetitive Taylorised labor, an instability brought about by frequent and forceful struggle by workers in the workplace' (Coriat, 1984: 40). The period was characterised, moreover, by a shift from wage-related demands to demands for the reorganisation of work processes and improved conditions[27].

According to Aglietta, 'The class struggles in production today bear the germ of a major new transformation of the labour process - Neo-Fordism' (1979: 122; see also Palliox, 1976, from whom this term is borrowed). This strategy combines automatic production control (or automation) and new forms of work organisation, 'now in embryo', based on the recomposition of tasks.

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[27]Coriat goes further and argues: 'Taken together, these demands constituted something close to a program for revision of workplace relations, a program for which the working class actively fought and struggled' (1984: 41). This position is heavily influenced by the Italian tradition of 'autonomist' marxism (e.g. Negri, 1990). Aglietta (1979: 28) also acknowledges a debt to Negri.

Automation addresses the technical limits of Fordism which gave rise to increased porosity of the working day:

> The new principle of work organisation is that of a totally integrated system in which production operations properly so called, as well as measurement and handling of information, react upon one another as elements in a single process, in successive and separate steps of an empirical process of heterogeneous phases (Aglietta, 1979: 124).

This integration of discrete and diverse elements of production into a more unified and smoother productive flow has implications for the nature of work. The 'mechanical principle of fragmented labour discipline by hierarchical direction' is replaced by an 'informational principle' of work organized in semi-autonomous groups, disciplined by the direct constraint of production itself' (Aglietta, 1979: 167). The application of microelectronics to production, according to Coriat, makes possible 'new forms of time management and flow control on the shopfloor', which 'result in considerable time-savings in production as well as increased efficiency in the utilisation of machines and tools' (1984: 40).

The early work within the regulation approach framed the discussion of the restructuring of the Fordist labour process in the terms of a profound defeat of the European and North American labour movements[28]. Lately though, writers in the regulation tradition have

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[28]Boyer, for instance, identified five forms of flexibility as emerging within European labour relations: the general adaptability of the productive organisation to endemic uncertainty; moves toward a more polyvalent workers; the erosion of legal constraints on the employment contract; attempts to increase the sensitivity of wages to the economic

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begun to argue, rather in the manner of Kern and Schumann, that the active participation of the workforce is required to ensure the optimum performance of the new technologies and in the struggle for the improved quality which Japanese competition demands. Current attempts to reorganise work are seen as an attempt to come to terms with the 'paradoxical involvement' of semi-skilled workers. This suggests that Taylorist factory structures polarised the collective capacity for innovation which is now at a premium: 'Most of the production teams found themselves excluded in principle from the battle for productivity and quality' (Leborgne and Lipietz,1988: 265; emphasis in original). Yet, most 'Taylorised' operatives continued to intervene in order to optimise the production process even against the instructions of the O&M office: 'They do so to assert their autonomy as human beings' (ibid). Current experiments are a recognition of this and an attempt to exploit this aspect of workers' knowledge for the purposes of valorisation.

The fundamental source of the crisis of Fordism, therefore, is this 'crisis of informal involvement of workers in production' (Lipietz, 1978). Fordism increasingly failed to secure the conscious, 'formal' commitment of workers in the struggle of productivity. Lipietz (1987) proposes an 'anti-Taylorian' revolution which would bring into being a new class

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situation of the firm; and the growing freedom of the enterprise to dispense with social and fiscal contributions. He concluded: '...in these times of crisis, flexibility strategies have entailed under various euphemisms, the downward adjustment of most hitherto established conditions of employment of workers' (1987: 115).

compromise that would secure, simultaneously, the socio-technical requirements for transcending the productivity slowdown and as a means to to secure the economic and political requirements for society-wide consent and stability. Workers would offer increased involvement in, and commitment to, improving production on the basis of enhanced skills and team-work. Capitalists would provide guarantees of employment, enriched jobs and a share in productivity growth.

Thus Leborgne and Lipietz state:

> Hence the real industrial divide: is the classical Fordist division of labour going to be reshaped or not; is the workers' involvement definitely going to be down-played; or, on the contrary, will its 'paradoxical' character be offset, thus reducing the division between design, maintenance and manufacturing? (1988: 268).

Even Coriat (1987), formerly the principal advocate of the class struggle wing of regulation theory, argues that a trend toward the devolution of management tasks to the workshop is underway. In his early work Coriat focused on the role of microelectronics in securing a greater integration of production in large scale industry. Lately, this focus on the use of computer technology has been complemented by an emphasis on 'flexibility' akin to that the flexible specialisation thesis. Basing his argument on research in small footwear firms, Coriat (1987) argues computer technology is facilitating rapid product shifts.

The increased presence of microelectronics in the firm, moreover, allows certain key tasks planning to be devolved to the shopfloor. These tasks include certain production planning functions and tasks related to the 'calculation of the costs of production' (1987: 11) which are

necessary for maximising the rate of utilisation of equipment - such as wage systems designed to make workers partly responsible for prices and costs. The separation between conception and execution is being blurred as work becomes more 'team-oriented'. Coriat has outlined what he believes to be the implications of this: 'If our hypothesis about the new content of productivity is correct, the different solutions being tried for work organisation and skill distribution are not equally efficient'. Moreover, the question of skill and hierarchy in the workshop 'can no longer be treated as 'social' issues; they belong to the core of the competitive dilemma' (Coriat, 1987: 12). A new economic rationality is underpinning workplace restructuring.

Leborgne and Lipietz present a typology of three emerging labour processes which, they indicate, represent the choices facing contemporary capitalist societies. The first tendency is toward a 'neo-Taylorist' labour process. This is represented by FIAT's Turin operations and involves more automation and deepening Taylorist principles: 'Not a pleasant future, but a possible one' (Leborgne and Lipietz, 1988: 272). The second tendency is toward a 'Californian' labour process. This allows flexible production but on the basis of low capital intensity and worker's involvement is on an individual basis. Silicon Valley is the model. However, Leborgne and Lipietz speculate on the problems of regulating this system at the macroeconomic level. The third labour process is termed 'Saturnian' (in homage to GM's experimental plant). The workforce is committed to cooperation in the pursuit of innovation but on the basis of collective bargaining and a

rigid wage contract. This has appeal to both management and labour. Alternatively this model is termed Kalmarian.

The work of the regulation approach writers on the labour process makes a number of useful contributions. The emphasis on the changing nature of skills, and the emergence, particularly within mass production industries, of forms of work which are more 'abstract' and more concerned with system optimisation accords with arguments advanced earlier in this chapter. Equally, the theorisation of the use of information technology in terms of its contribution to the greater integration of the labour process also resonates with earlier arguments. However, while the early work of the regulation approach recognised that technical change and the reform of work were determined by the exigencies of the valorisation process resulting in tendencies toward intensification; the later work of the regulation approach, in emphasising the necessity for a new bargain between capital and labour, has downplayed these insights.

The work of Leborgne and Lipietz is interesting for its attempt to retain the possibility of a diversity of outcomes in the present period of restructuring, but increasingly the regulation approach is underpinned by the belief that contemporary workplace change embodies a new economic rationality which necessitates a new bargain between capital and labour. There is a tendency in this approach, however, to underestimate the extent to which cooperation can be coerced rather bargained. This is amply demonstrated by the Japanese case which illustrates that 'teamwork' and 'cooperation' can be secured through

tying workers fortunes closely to the competitive fortunes of individual firms (see section four). Equally, 'cooperation' can be elicited through he sanction of labour market pressures in a period of mass unemployment (see Chapter Three).

6. ELEMENTS OF AN ALTERNATIVE APPROACH

The aim of the foregoing sections has been to outline and criticise the contributions which have gone to make up the new orthodoxy. This new orthodoxy is founded on a basic optimism that the direction of technical change is forcing employers into establishing more cooperative relations with labour. This has had the effect of reversing the preceding emphasis on the degradation of labour which hitherto dominated industrial sociology, but on the basis of the evidence presented in the previous sections the proposition that the new direction of workplace change is inherently beneficial for labour, needs to be treated with caution. This necessitates an alternative explanation of the nature of contemporary workplace change. On the basis of a synthesis of earlier criticisms of the new orthodoxy, and drawing on the alternative propositions outlined, the last section of this chapter seeks to outline the basic elements of an alternative interpretation of change.

A basis for optimism?

Despite the criticisms made against their optimistic assertions, post-Fordist writers have not dulled in their enthusiasm for their

version of contemporary workplace change. In a recent paper Piore (1990) has argued instead for the mobilisation of the concepts of work, labour and action developed by Hannah Arendt[29]. Piore argues that production, as it occurs in industrial districts and 'decentralised' corporate structures, conforms to Arendt's definition of 'action'. The central activity is not the creation of goods, as such, but 'the discourse which surrounds the production process, and the opportunity which that discourse provides each person to reveal him or herself as an individual to his or her interlocutors and collaborators' (1990: 66). Productive activity is becoming a deeply and inherently satisfying experience, rather than one characterised by exploitation and conflict. The structure of large firms and industrial districts, Piore contends, are converging - both are becoming 'communities' of producers. This position appears to assume that the exercise of managerial authority has evaporated and posits a workplace largely devoid of the conflicts hitherto considered endemic in capitalist enterprise[30].

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[29]In doing so Piore, without acknowledging the widespread criticism of this concept appears to distance himself from the idea of 'revitalised craft-work'.

[30]Part of the significance of the 'Japanisation' thesis for claims about post-Fordism, lies in the support it offers for the notion of a conflict-free workplace. For instance, the position of the Kyoto School on work organisation, nenko and company unionism is underpinned by a particular theory of the firm developed in opposition the neo-classical approach (which assumes activity is guided by the pursuit of profit maximization). Employees and shareholders are seen as the firm's 'constituents' and their interests are both considered in the formation of management policy. Management itself is seen as playing the role of 'mediator', 'striking a balance' between the interests of shareholders and those of employees, with the enterprise union forming part of the firm's substructure (Aoki, 1984, 1987). The fact that personal shareholdings of the founding families of companies such as Matsushita

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Piore's recent contribution captures the underlying tenor of the 'post-Fordist' thesis, but is firmly challenged by the evidence of the preceding sections, from which a number of general propositions emerge. Firstly, where computer technology is being introduced, there is little evidence that its introduction signals the re-emergence of craft-work. Far from facilitating the resurgence of artisanal production, the computerisation of processes is occurring in ways which consolidate large scale production. Generally, computerisation of processes is reflective of the growing capital intensity of large scale industry. In this context computerisation of production processes is more concerned with improving the control and integration of the productive flow, than with facilitating rapid product changes. Moreover, while improved production flows in mass production are a general aim of management, there are several ways to achieve this end. Japanese managements achieve a smoother production flow through innovations such as JIT which appear unconnected to any specific technology. The pattern of change, moreover, is more incremental and evolutionary than is implied by concepts such 'post-Fordism'.

Secondly, the 'post-Fordist' thesis may be right to draw our attention to changes in the content of work, but it frequently overstates the extent of change and misconstrues its nature. Kern and Schumann, in their rejection of the idea of 'revitalised craft-work', come close to

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or Toyota are very small is offered as evidence that: 'In such firms, employees feel they are not working for the profit of owners but for their own employment' (Koike, 1987: 307-8).

capturing the new content of work in capital intensive production when they stress the extent to which increasingly the worker 'supports the technical autonomy of the system', noting that the worker is less materials oriented and more concerned with technical and organisational procedures[31]. The new 'skills' associated in different ways with the German and Japanese models, however, are of a limited nature. Although the range of specific dexterities and competencies may be extended under these systems, in principle, they reflect little more than the erosion and recasting of demarcations between direct and in-direct jobs. On the basis of this conception Malsch et al, reviewing German evidence, conclude:

> ..if Fordism is seen as synonymous with management control over the labour-process, it is not the end but rather a historical modification of Fordism, perhaps an 'automated Fordism'...In this perspective the new comprehensive skilled worker represents progress in comparison with the exaggerated one-sided deployment of the old mass worker, but there is, however, no reason to create a new legend of the skilled worker (Malsch et al, 1984: 44)[32].

The post-Fordist approaches also tend to neglect the issue of how these new 'skilled' jobs are integrated into the wider, centrally-determined, division of labour. They tend to overlook, therefore, the extent to

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[31]This 'new' work content, however, was identified as a growing tendency in large scale industry in the mid-nineteenth century: 'Labour no longer appears so much to be included within the production process; rather, the human being comes to relate more as watchman and regulator to the production process itself' (Marx, 1973: 705).

[32]In the case of 'teamworking', I would argue, especially in its Japanese variants, the simplification of the range of tasks is a prerequisite of production workers being able to perform all the tasks in the team. Paradoxically, therefore, an intense fragmentation of tasks is the foundation of this 'skilled' work.

which 'reskilling' may facilitate an intensification of the labour process. This tendency, which seems so central to current developments in all their forms, largely is ignored in the post-Fordist accounts.

Thirdly, while it may be true that in some cases the process of workplace change has bestowed benefits on certain groups of workers, in certain places, at certain times, one important conclusion to be drawn from the evidence presented in this chapter is that the process of workplace change continues to be socially contested. This is obvious even in the Italian case so celebrated by the flexible specialisation approach. A large part of the flexible specialisation thesis rests on the claims made for the performance of small firms in central Italy, but as Fergus Murray notes, through its fixation with the Third Italy, the flexible specialisation thesis is able to ignore other Italian evidence which contradicts its own claims:

> Sabel tends to represent the co-existence of, and connections between, a buoyant small/medium firm sector and a northern multinational-dominated sector, as the former replacing the latter. This is not the case, but the formulation neatly avoids the question of multinational capital and the much more problematic transfer of ownership and control, and labour process transformation, in this sector' (1987: 86).

The labour process transformations in the 'Fordist' sectors of Italian industry do not conform to the portrait of enskilling and harmony painted by Piore and Sabel. The Fordist sectors have been characterised by intense class conflicts[33]. Sabel has little to say about

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[33]The example of FIAT offers powerful support for this view. Faced with growing unrest in its huge, integrated plants in Turin, FIAT embarked on a large-scale programme of automation along 'neo-Taylorist'

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this aspect of industrial change in contemporary Italy. Industrial change remains socially contested and this means that the process of restructuring is highly uneven.

A historical divide?

The argument that the capitalist labour process has been characterised by sharp discontinuities in industrial practice - expressed in the transition to Fordism and from Fordism to post-Fordism - is difficult to sustain. Ever since the Industrial Revolution the capitalist labour process has undergone transformation through the introduction of new techniques and work practices and skill patterns. Fordism, as defined by the new orthodoxy, consisted of the twin processes of the fragmentation of tasks (Taylorism) and the growth of mechanisation around dedicated machinery. However, the extent to which these developments represented a radical departure from existing tendencies in the transformation of the capitalist labour process, is dubious.

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lines (Leborgne and Lipietz, 1989; also Partridge, 1984) and productive decentralisation to the Mezzogiorno and central Italy, aimed at undermining the cohesion of its workforce and the legislative gains made in the period after the Hot Autumn (Amin, 1982; Spriano, 1985). The heavy defeat inflicted on the Turin FIAT unions with the collapse of the six week strike of 1980 was the prelude for this restructuring (Revelli, 1982; Rollier, 1986). Cesare Romiti, FIAT's managing director, has said of this period: 'Afterwards politicians told me that they regarded [the confrontation with the unions] as a turning point when the capitalist system in Italy could have been overthrown...The principle objective of the clash with the trade unions was to allow us to build a sound basis for FIAT's future. Having started the battle we were totally committed to carry it through to the end, and we were convinced that we would win' (quoted in The Guardian, 8.4.87).

Marx, for instance, drawing on the work of Charles Babbage and Andrew Ure analysed the emergence of large scale industry (machinofacture) in the nineteenth century, precisely in these terms. Tendencies within 'manufacture' for the break up of complex, skilled tasks into simplified, deskilled ones through a deepening of the detailed division of labour, culminated in machinofacture, which was concomitant with the 'real subordination of labour'[34]. This rendered the labour process more continuous through a 'closer filling up of the pores of the working day' or a 'condensation of labour' (Marx, 1974a: 534) and facilitated further mechanisation, although it was seen as necessarily incomplete and subject to continuous challenge (cf. Thompson, 1967).

Taylorism and Fordism were forms of work organisation which led to the further integration of production. In particular, Ford's adoption of the assembly line represented a breakthrough in the historic problem, identified by Marx among others, of the rationalisation and mechanisation of the transfer of material and assemblies[35]. Taylorist and Fordist principles tended to be applied most extensively in conditions of mass markets, mass production and high velocity of

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[34]That is, the thoroughgoing domination of the labour process by the exclusively capitalist imperative of valorisation. Marx discusses this tendency in his Resultate (see Marx , 1974a: 1019-1028).

[35]Hounshell (1984) emphasises important lines of continuity between Ford's innovations and the preceding ones of Singer, Colt and other pioneers of the 'American system of manufactures'. For Hounshell the great innovation of the latter system was the creation of truly interchangeable component parts, which allowed the development of rationalised assembly. Accordingly, Fordism is seen as a particular expression of this emerging trajectory (see also Walker, 1989).

throughput. Taylor advocated bureaucratisation of the shopfloor (through time and motion study) as means to solve the problems of coordination and reintegration raised by the increasingly complex division of labour. Ford's innovation was to propose technical solutions which established a rationalisation pattern for mass production industries. The essential underlying principle of both Taylorism and Fordism, though, was the institution of a flow line, designed to ensure high rates of utilisation of fixed capital.

Fordism and Taylorism, however, were not universally applicable. There were technical limits to mechanisation in some industries (Walker, 1989). Indeed, some factories may have been partly rationalised along Taylorist lines, while other parts of the factory (or process) remained untouched (Littler, 1982) and limited market size precluded extensive mechanisation and the pursuit of rationalisation (Littler, 1983, Walker, 1989). The decomposition of tasks had its limits as Adam Smith noted. Chris Smith (1989) notes that the false dichotomy of craft and mass production (or Fordist and post-Fordist production) conveniently ignores established industrial classifications of unit, batch, mass and process production[36]. Quite simply, many industries were never Fordist (Sayer, 1985; Clarke, 1988b). As Elger puts it:

> The decades spanning the turn of the century, then, marked a period of major capitalist initiatives concerned to secure adequate valorisation and accumulation in the context of intensifying international oligopolist competition and increased worker organisation. A substantial deepening of the real

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[36]Moreover, Walker (1989) notes that general purpose machines far from replacing dedicated ones have an industrial history which is seperate from that of 'Fordism'.

> subordination of the labour process to capital, accomplished through a combination of mechanisation and Taylorist specialisation and simplification of labour, was and remains central to, but not exhaustive of, the strategy of capital (1979: 81)

Taylorism and mechanisation did not 'create a simply homogeneous mass of deskilled labour' but rather 'a complex, internally differentiated apparatus of collective labour which contained an uneven variety of narrow skills and specific dexterities' (Elger, 1979: 82). The post-Fordist thesis, however, contrives to present the mass production 'paradigm' as one of homogenised deskilled labour in order to highlight the contrast with 'new' skilled work[37].

What Taylorism and Fordism do express, however, are a particular solution to an essential capitalist problem, resulting from the growing capital intensity of production and the need to ensure continuous production. As Alfred Sohn Rethel noted:

> Growing capital intensity and a rising organic composition of capital leads, at a certain point, to a changing costing structure of production, amounting to an increasing dominance of the so-called indirect or fixed element of cost (1978: 144).

Moreover:

> The dominance of overhead cost is associated with a specific economy of time relating to the labour process of production. The more highly the production capacity of a given plant is utilised, that is to say, the more products are turned out in

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[37]The idea that the long post-war boom was underpinned by 'Fordism' therefore is difficult to sustain. As Williams et al observe: 'Ford's innovations may have been important but they are hardly responsible for the whole trajectory of development in the advanced economies. Rather they created...assembly industries' (1987: 421). I would suggest, though, that, within industries organised along these lines, the tendency to Taylorist forms of work organisation was important.

> a given time and, as a consequence, the quicker the capital can be turned over, then the lower is the unit cost of the output and the greater the competitive struggle for profit under conditions of monopoly capitalism (1978: 148)[38].

Fordism and Taylorism, according to Sohn Rethel represented a particular 'economy of time' based on the mechanisation of transfer:

> The flow method of manufacture is the mode of production most perfectly adapted to the demands of the economy of time in monopoly capital. The entirety of a workshop or factory is integrated into one continuous process in the service of the rule of speed (1978: 161).

I would argue that what the new orthodoxy take as evidence of the 'end of Fordism' are a set of more limited, but nonetheless significant, developments of this broad tendency. The role of innovations in microelectronic technology in this process, is important.

The nature of change

For Sohn-Rethel, Fordist assembly lines were the ultimate expression of the capitalist necessity of achieving a continuous production flow. However, contemporary developments illustrate that this is a historic capitalist pursuit, which is subject to periodic development reflected in the continued transformation of the labour process. Under Fordism,

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[38]This reflects an essential capitalist concern identified by Marx: 'The value of fixed capital is reproduced only in so far as it is used up in the production process. Through disuse it loses its use value without its value being passed onto the product. Hence, the greater the scale on which fixed capital develops, in the sense in which we regard it here, the more does the continuity of the production process or the constant flow of reproduction become an externally compelling condition for the mode of production founded on capital (Marx, 1973: 703).

mechanical lines, for instance, created a new set of problems with flow coordination, work pace equalisation and fixed work sequencing. Taylorist methods attempted to integrate the production through work study, recording of information and the creation of bureaucratic strata of management but have often merely exacerbated the problem of production imbalances and idle periods. Information technology, however, has given rise to new attempts at integrating the production through the 'mechanisation' of information:

> A big jump is achieved with on-line monitoring for continuous data collection on the various dimensions of production, directed automatically by computers with sophisticated programming. Mechanization of information flows may be more important for overall productivity than the mechanization of individual tasks (Walker, 1989: 67).

The application of information technology to production, however, has been uneven, reflecting different technical and economic limits (Walker, 1989). Automation was established as a trend in series and process industries, for instance, long before 'the crisis of Fordism', while it had a much more limited application in batch industries. The significance of information technology is that it raises the possibility of automating non-mass production. As Williams et al (1987) note the likely outcome of this process is to establish in batch production principles akin to those of mass production and to make it more capital intensive. In process industries and mass production while there is little evidence for an 'automation revolution' (cf. Littler, 1983), information technologies do allow a further integration of the production process - a further extension of flow principles. A certain technological convergence be occurring between batch, mass and flow production industries. Coriat, for instance, has argued that 'the

automated Fordist workshop' is beginning to 'take on certain features of process type work' (1981: 100; my translation; cf. Malsch et al, 1984).

This view point is emphasised by critical German research which sees the application of information technology as uniting traditional management concerns with the integration of production with extended managerial control over the productive flow. According to a sympathetic review of this position:

> By virtue of their large capacity for reproducing and extending information processing operations, computer technologies can be used to take over planning functions associated with organisation and control. They offer a new level of integration of the production process, for example, through the integration of partial work functions into a continuous process, through matching temporally the insertion of the different production factors, and through transforming the demands of the market into optimal production commands (processing data on market situation, orders and delivery times). The result is a significant step forward in the penetration of both time economy and of the real subsumption of labour under capital. Subsumption now tends to reach out to include complex, mental functions, thereby giving new impetus to automation and the prospect of direct control of the production process through external data and planning (Campbell, 1989: 264, emphasis added).

This process is seen as especially important in batch production, where flexibly deployed skills have traditionally been important. Computer technology is seen as overcoming these obstacles to give greater control over production and of subjecting these processes further to the exigencies of valorisation.

The critical research within the German debates and the early work of the regulation school tends to see technical change and new forms of work organisation more as developments of existing trends: 'the modification of Taylorism' (Altmann and Dull, 1990: 112; see also Dull,

1989), 'flexible Taylorism' (Berggren, 1989: 193) or 'automated Fordism' (Malsch et al, 1984; Coriat, 1981) or 'neo-Fordism' (Aglietta, 19790. This view sees contemporary innovations in work organisation as addressing certain limits of Taylorist and Fordist type principles of work organisation rather than representing a radical, new departure. If the new production concepts are an isolated phenomenon then the dominant tendency is likely to be toward the creation of new types of semi-skilled production work. In both cases, though, the tendency is for the worker to be further integrated into a predetermined process[39]. The changes identified by the critical German research are incremental and uneven, rather than radical and universal. Such changes, however, remain important[40].

The impact of technical change on skill formation is likely to be diverse and complex. However, growing capital intensity and automation does

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[39]The penetration of time economy, however, is uneven, occurring 'neither simultaneously nor with same dynamic and intensity'. Instead: 'the targets, course and degree of reorganisation processes seen from the angle of the economy of time, are in the end determined by the economic, technical and material conditions of production, which are varying from industry to industry' (Benz-Overhage, 1982: 89, translated in Papadimitriou, 1986: 38).

[40]At the same time, Japanese production systems are characterised by the pursuit of a smoother and more integrated production flow, although information technology is less central, than is reorganisation of work itself (Sayer, 1986, Jurgens, 1989). Japanese methods signal 'a redirection from the classic Fordist obsessions with specialized conversion machinery or automated transfer toward the integration function in general' (Walker, 1989: 68). The pursuit of 'continuous flow' is the central aim but it is achieved through incremental inprovements to work practices and technical systems (Schonberger, 1982).

lead to a growing importance, for management, of creating active vigilance, responsibility and initiative among workers on its behalf, as a result of increasing integration, interdependency and capital intensity (cf. Elger, 1979)[41]. However, the forms of limited expertise and empirical skill arising from this imperative are subordinated to the demands of valorisation. This position emerges from the research programme of the Institut fur Sozialforschung (IfS) at Frankfurt (eg. Brandt, 1986; Hoss, 1986; Papadimitriou, 1986) and the Institut fur Sozialwissenschaftliche Forschung (ISF) at Munich (eg. Altmann and Dull, 1990; Dull, 1989) developed in opposition to the theory of 'new production concepts'. According to this research, in general terms the 'computerisation' of industrial processes gives rise to a relative homogenisation of conditions as between mass and batch production and reflected the heightened importance attached to capital utilisation. This in turn leads to the emergence of a new type of semi-skilled work:

> This seems similar to the type of complex semi-skilled tasks (like monitoring and controlling production equipment) which has long existed in the steel industry and the chemical industry...This type of industrial work is above all characterised by a discrepancy between specific requirements and work stress: as long as the production process proceeds trouble-free, work is neither physically nor mentally challenging whereas contingencies strain concentration and perception as well as intellectual and reactive capacity to the utmost (Papadimitriou, 1986: 43; cf. Altmann and Dull, 1990).

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[41]As Marx noted: 'The capitalist's fanatical insistence on economy in means of production is therefore quite understandable. That nothing is lost or wasted and the means of production are consumed only in the manner required by production itself, depends partly on the skill and intelligence of the labourers and partly on discipline enforced by the capitalist for the combined labour' (Marx, 1974b: 83).

To the extent that new production systems attempt to harness the subjective aspects of workers' abilities, this is seen as overcoming certain limitations in hierarchical forms of work organisation in ways which reflect a continuing logic of rationalisation:

> ..that is to utilize the resources inherent in labour power and new technologies in an isolated and fragmented manner while at the same time integrating and optimizing them by organizing the production framework and structuring the collective worker (Dull, 1984, translated in Hoss, 1986: 254)[42].

For the critics it is the subordination of the new forms of work organisation to the imperatives of the process of valorisation which gives them their characteristic tendency toward intensification[43].

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[42]Work is becoming more 'abstract' in the sense that it is becoming less concerned with particular skills of material conversion and more with machine optimisation. Conversion itself is a function of the entire process. Marx noted this tendency within large scale industry: '...the product ceases to be the product of the isolated direct labour and the combination of social activity appears, rather, as the producer (1973: 709).

[43]Coriat's (1980) study of group working in the French car industry offers support for these broad hypotheses. Although, in the most advanced forms these methods raised the possibility of less repetitive work and a certain 'freedom' to manage production time, control of the overall work pace remained firmly in the hands of management who determined output norms and monitored performance centrally. For Coriat, like the critical German writers, such tendencies corresponded to the traditional ends of rationalisation: 'Thus, a reduction of the transfer times and the losses associated with the assembly line model; the conversion of all or part of this time into effectively productive time; the new possibility for the worker to accumulate small time-gains in relation to 'theoretical' production times. All this is based on the intensification of labour, by the increase in the number of productive actions in the course of the working day' (1980: 40; cf. the comments of V. Haas in section four). For Coriat this represented a 'new economy of time and control'.

Also, this perspective, far from seeing the capitalist demand for teamwork raising the possibility of a new social bargain in the workplace, the development of semi-autonomous teamwork is the attempt to 'subordinate labour power also on the level of motivational abilities to capitalist exploitation' (Hoss, 1986: 254). This process perhaps is best exemplified by the Japanese case where the mobilisation of workers' creativity in the struggle for corporate success is more extensive and systematic than that achieved in countries like Germany (Jurgens, 1989). Whether such developments lead to improvements in workers' conditions is seen as highly contingent. However, under the conditions prevailing in Germany in the 1980s, the critics observe that additional responsibilities without relaxation of time standards is leading to a general process of intensification. This process is not accompanied by improved occupational status or systematic retraining because 'the skill problem is solved by selection' (Hoss, 1986: 256). Also, the new production concepts are restricted to strategically significant sections of the production process and autonomy is limited by increased power delegated to lower parts of the managerial hierarchy (cf. Dankbaar, 1989b: 36). Accordingly, the new production concepts in both limited and advanced forms are seen as 'a further decisive step of the 'real subsumption' labour under capital' (Hoss, 1986: 257).

However, there remains a problem with the conceptualisation of change outlined in the critical German debates, namely the use of the notion of 'real subordination'. In the IfS approach the 'computerisation' of the production process is securing the complete domination of labour by managerial authority. This is ironic given that Braverman, for

instance, appeared to assume that Taylorism had achieved precisely this end. In a broader sense, it was a view held by the Frankfurt School as early as the 1930s, and by commentators such as Charles Babbage and Andrew Ure before them. However, a more open use of the concept of real subordination would help to account for the extension of continued workplace conflict and worker gains. As Elger puts it:

> 'it is necessary to recognise that the continually revolutionised character of modern mechanised production persistently renders 'incomplete' the subordination of labour to capital (in the sense of total direction and control by capital). On the one hand it creates new skills competencies and other opportunities for bargaining leverage arising from the complex coordination and interdependence of the collective labourer; on the other hand in phases of rapid accumulation unaccompanied by massive displacement of living labour by dead labour, it depletes the reserve army and provides the basis for powerful worker organisation' (1979: 65-6; see also Marx, 1974c: 1019-28)[44].

For the IfS writers the further penetration of the time economy is a step on the inexorable subordination of labour to capital (cf. Sohn Rethel, 1978). Coriat's preference (in his early work) to write of the search for new 'time and control economies' could signal a more open usage of the concept of subordination, in keeping with Elger's (1979) argument that technical change and the transformation of work renders it persistently 'incomplete'. Coriat's approach raises the possibility for genuine diversity and contest in the struggle for productivity improvement, rather than the merely formal acceptance of this possibility in the work of the IfS. Such an approach might also help to

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[44]In particular, while identifying an important trend toward computerisation, the IfS writers seriously underestimate the difficulties of using such technologies in practice (eg. Walker, 1989; see also Chapter Six below).

account for apparent gains of German workers - which even critical writers in Germany recognise as a possibility in the present restructuring.

My argument, then, is not that workers can never gain from the process of technical change or workplace restructuring but that technical change does not guarantee such an outcome, even where it demands more active participation from the workforce. In the German case (or the Swedish one) where workers can point to a real concern on the part of management (or sections of it) for the humanisation of work, this reflects more than technical requirements. In particular, it reflects the historic strength of the workers' movement in those countries, and the patterns of class accommodation which have developed from these. These have resulted in institutional forms of industrial relations which, through works councils and co-determination, accord labour an institutional lever in the process of workplace restructuring (see especially Streeck, 1985). In contrast, the particular pattern of rationalisation which has dominated in Japan has been built on the the structural weaknesses of company unions.

The important underlying differences between these patterns of restructuring and the extent to which they are rooted in specific histories and geographies tends to be obscured when they are offered merely as examples of an unfolding logic of 'post-Fordist' restructuring. The distinguishing feature of the post-war economic growth, therefore, was not so much that it was 'Fordist' (based on mass production for mass markets), but that it was underpinned by 'the institutionalisation

of a particular balance of class forces, in which rising wages and rising levels of social expenditure were the price paid for the industrial and political integration of the working class' (Clarke, 1988b: 85). It is the character of this accommodation, which varies significantly from place to place, which is the decisive factor in accounting for variations in the national patterns of change.

An important determining character of the nature of workplace change, then, is the balance of forces existing between management and labour be it at the level of the firm, industry, region or nation. This observation is of wider significance because it implies that, despite certain common concerns borne of an age in which capital-intensive forms of production are of heightened importance, unevenness is embedded in the process of change at every level. A sensitivity to the historicity and spatiality of restructuring is essential[45].

7 CONCLUSION

In this chapter I have sought to criticise those theoretical approaches which claim that since the end of the 1970s radical transformation has

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[45]Badham and Matthews (1989) recently have attempted to rescue the broad 'post-Fordist' agenda from its critics. They argue that the scenario offered by Piore and Sabel should be seen as just one possible outcome to the process of change. Instead they develop a three dimensional model of the production system based on axes of product innovation, process variability and labour responsibility along which any region can be situated. While of doubtful heuristic value, I would argue their approach, rather than signalling a brave new Fordist world, serves principally to illustrate that diversity is embedded in the process of change.

occurred in the nature of industrial work and that this has been generally positive for labour. What post-Fordist writers take to be signs of the end of mass production, are better seen as rather more incremental developments in the organisation of large scale industry. These seem to be part of a longer term process of change directed at the achievement of continuous flow production. New technology and new forms of work organisation (which are not always related) are typically concerned with establishing a greater integration of the production process. What is taken as a signal of the demise of Fordism represents in some cases an intensification or at least a reformulation of it. Post-Fordist writers identify new forms of skilled work. In practice these generally turn out to be the accumulation of limited extra competences. Where post-Fordist writers see the emergence of a necessity for capital to adopt a more 'positive' attitude toward labour they identify a real tendency associated with growing capital intensity. However, such accounts neglect the constraints under which 'cooperation' is elicited and 'autonomy' granted. The contention that the present period is characterised by the unfolding of a new, universal 'post-Fordism' ignores the unevenness and diversity built into the process of change. In particular, this unevenness reflects quite specific national patterns of change, which are not captured by concepts such as 'post-Fordism'. While accepting that capitalist restructuring is likely to reflect certain essential characteristics the forms which these can take are varied. Coriat's (1980, 1984) notion that restructuring reflects the search for 'new time and control economies' seems sufficiently open to capture this possibility of

diversity, while concentrating attention on the essential ends of such restructuring.

These propositions form the conceptual background to the empirical investigations in the remainder of this thesis. The case study of restructuring in the British coal industry is designed to illustrate the historic pursuit of time and control economies in one sectoral context. Present restructuring in coal accords an important place to the introduction of microelectronic-based process technology. In order to assess the degree to which contemporary developments in coal production can be seen as radical departure along the lines suggested by the 'post-Fordist' thesis, or as something which emerges incrementally from a past trajectory of labour process transformation, present developments are situated in their historical context. Furthermore, given the emphasis placed on the uneven nature of the transformation of labour process in the last section, the concrete nature of restructuring is examined through experience of restructuring in two different coalfields.

I have suggested in this chapter, that while capitalist enterprises are characterised by a universal pursuit of time and control economies borne of the valorisation imperative, the concrete forms of production are likely to be diverse. I have stressed the extent to which particular trajectories of restructuring owe less to a 'crisis of Fordism' and to the subsequent emergence of a new 'post-Fordist' logic of restructuring, than to nationally distinctive patterns of class conflict and accommodation. Restructuring in the British coal industry, then, needs

to be placed in the context of the broader pattern of industrial change. Chapter Three offers an account of the nature of restructuring in Britain in the 1980s. The chapter begins by noting the difficulties of subsuming this restructuring into the 'post-Fordist' thesis. In Britain, restructuring in the 1980s owed little to attempts to create a 'post-Fordist' economy and more to state-inspired attempts to alter explicitly the balance of class forces in favour of capital.

CHAPTER THREE

POST-FORDIST BRITAIN?

1. INTRODUCTION

This chapter develops the argument that the pattern of workplace change is highly uneven, through a discussion of contemporary workplace change in Britain. Chapter Two showed how industrial sociology has been dominated increasingly by accounts which suggest that workplace change can be understood in terms of the emergence of a radical new logic of 'post-Fordist' restructuring, which has positive implications for workers. Yet, the evidence on which the claims for the emergence of post-Fordism are based, tends to indicate more incremental and limited forms of change which are influenced crucially by national, historical factors. In order to understand the significance of the diverse nature of actual patterns of restructuring due regard must be paid to national trajectories of industrial change, which are themselves the outcome of past patterns of social conflict and accommodation. This chapter illustrates the value of this approach through an examination of the British case.

My aim is to offer an account of change situated within the 'particularities of the British economy' as they relate to workplace change (cf. Fine and Harris, 1986; Tailby and Whitson, 1989). The argument advanced is that during the post-war period, economic restructuring in Britain has tended increasingly to have a

low-wage/low-productivity bias in the context of advanced capitalism. It is argued also that the state has played a key role in promulgating labour process changes quite sharply at odds with the post-Fordist thesis. With the advent, in 1979, of a government inspired by the ideology of the New Right, a reduction in the power of trade unions and, specifically, a reduction in their influence within the workplace, came to be a prerequisite of economic restructuring. This strategy was embodied in the frequently employed rhetoric about the need to reassert 'management's right to manage'. Thus, even where the state itself had sanctioned large investments in new technology, in the nationalised industries, the process of restructuring has been one driven by a concern with subordinating the position of labour within the workplace.

The chapter begins, therefore, by criticising attempts to account for the pattern of workplace change by reference to 'post-Fordist' theories. These approaches fall into three broad categories. First, attempts have been made to present the nature of industrial change in Britain in terms of a successful strategy of 'post-Fordist' restructuring initiated by the Thatcher governments. This view is associated, in particular, with the Communist Party journal Marxism Today (also, CPGB, 1989). Secondly, some writers see contemporary industrial change as in some way reflecting the progressive 'Japanisation' of British industry (Oliver and Wilkinson, 1988; Hanosn, 1991). Finally, there is the argument that 'post-Fordism' is required in Britain, but that the restructuring of the 1980s has not brought this about (Hirst and Zeitlin, 1988, 1989). Each of these arguments is criticised for overlooking or misinterpreting key aspects of recent industrial history. It is suggested, instead, that

where workplace change has occurred, generally, it has taken on a specific character, which has little to do with 'post-Fordism'. In order to grasp the specific character of restructuring in Britain a different explanation is required. An adequate explanation of contemporary workplace change requires an understanding of the historical legacy of work practices and industrial relations, upon which contemporary changes have acted.

British manufacturing industry generally is held to have performed poorly in the post-war period (eg. Alford, 1988). Particular emphasis has been given to the role of trade union 'restrictive practices' in explaining this poor performance. The chapter outlines the development of this conception of the industrial problem and illustrates how it came to influence the activities of the state. During the 1980s British manufacturing industry witnessed a rapid rise in productivity, to the extent that some have identified a 'productivity miracle'. This productivity improvement is seen by some as the product of the industrial relations and economic reforms of the Thatcher governments which reduced the power of trade unions and restored managerial prerogative (see Hanson, 1991; and especially Metcalf, 1988, for whom the British coal industry is an example of this 'miracle'). Far from seeing this 'productivity miracle' as reflecting the emergence of a post-Fordist economy, the chapter stresses the fragility and limited nature of this industrial restructuring. The following section examines attempts to apply 'post-Fordist' analyses to the British case as prelude to offering an alternative account of this restructuring.

2. NEW AND FLEXIBLE TIMES? SINS OF OMISSION AND COMMISSION

There have been several attempts to account for the pattern of recent workplace change in Britain by reference to the new orthodoxy: the explicitly 'post-Fordist' (lately 'New Times') analysis of Marxism Today; accounts which identify the 'Japanisation' of industry; and the analysis of proponents of flexible specialisation. Despite differences between these conceptions, they are united by certain lacunae in their analyses which are highlighted below. Notably, they share in common a misreading or partial reading of recent British industrial history and, relatedly, a superficial grasp of the character of workplace change in the 1980s. This limits their ability to inform the debate on the nature of change in Britain and suggests the difficulties of applying post-Fordist analyses to the British experience.

The dominant, optimistic position on contemporary industrial restructuring has been advanced with vigour in Britain by the journal Marxism Today. This approach equates the industrial restructuring occurring in Britain under the direction of successive Conservative governments, to the logic of change required by the directives of the post-Fordist economy. To wit: 'Thatcherism is a hegemonic force, with the long term goal of transforming British society...a renovation of capitalism for the new times' (CPGB, 1989: 10)[1]. According to this

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[1]As one prominent sympathiser with this position, Hugo Young, has put it: 'What distinguishes the Marxism Taday treatment from most others is that it starts from facts not propaganda. It treats Mrs Thatcher not

(Footnote Continued)

perspective Thatcherism presided over the emergence of 'New Times' in Britain, propelled by the new logic of economic restructuring:

> At the industrial heart of the new times will be production based on a shift to information technology and microelectronics. New technology allows more intensive automation and its extension from larger to smaller companies, pulling together the shopfloor and the showroom. It allows production to be both more flexible, automated and integrated...Work is being organised around new technology. Traditional demarcation lines between blue collar and white collar workers, skilled and unskilled are being torn down in the wake of massive redundancies in manufacturing. In future, work in manufacturing will be about flexible team working within much smaller, more skilled workforces (CPGB, 1989: 6-7).

The Thatcher governments are seen as instrumental in orchestrating this change. One writer associated with the Communist Party's position has claimed that the Conservative government has fomented 'a revolution in the organisation of most British manufacturing companies' (Leadbetter, 1989: 28):

> Behind lies the factories of the past which produced most of the components they needed within a single site. They used a strict division of labour to produce large volumes of standardised products for a stable national market. Ahead lies the factory of the future. Many of its components will come from external suppliers. It will use interchangeable teams of skilled workers and flexible computer-controlled machinery to produce smaller batches of customised products for shifting international markets (ibid).

This approach, thus, conceives of a clear transition from Fordism to post-Fordism. However, the extent to which British industry typically can be categorised as having been 'Fordist' is doubtful (see below). At the same time, despite the assertions, there is little evidence to support

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(Footnote Continued)
as object of hatred, but more clinically: as a conduit and beneficiary of the social and economic trends which now dominate Western life' (The Guardian, 29.8.88).

this view of the dramatic nature of recent industrial change. For instance, on the basis of a survey of major flexibility agreements Incomes Data Services concluded:

> Myths about the advance in flexible working practices have misled many people into thinking that fundamental changes have taken place on a very wide scale. On the contrary, the fundamental changes are extremely narrowly concentrated in particular sectors of industry. And even where these changes have been taking place, they can be incomplete, halting or superficial (1986: 4).

Despite the authoritative tone, the Marxism Today approach does not offer a detailed analysis of the nature of the productivity improvement of the 1980s, although this would seem to be essential in order to situate their claims for a 'revolution' in the organisation of industrial production.

The 'Japanisation' thesis, also, has been pervasive in Britain. The UK, perhaps unique among the advanced industrial countries, has been characterised by a debate about the value of Japanese production methods and the extent to and means by which they can be implanted. Leading management figures have argued that the adoption of Japanese production methods by UK manufacturing companies could lead to large scale productivity increases based on the creation of the harmonious labour relations said to be characteristic of Japan (Parnaby, 1987; Wickens 1987). This is the background to the strong claims which have been made concerning the alleged 'Japanisation of British industry', through the arrival of Japanese manufacturing transplants, and through 'emulation' of Japanese work practices by indigenous firms. Oliver and Wilkinson in a survey of The Times 1000 companies claimed to have found evidence of widespread 'emulation' and continue to take the

perspective that 'Japanisation is a useful shorthand term for the emulation of Japanese industrial practice by Western companies' (Wilkinson and Oliver, 1989: 17)[2].

However, even where apparently clear cases of 'Japanisation' can be discerned it appears their novelty is often overestimated. Garrahan and Stewart (1989, 1990) have examined, for instance, the claims of 'Japanisation' made concerning Nissan's assembly plant in North East England. Despite the claims of its advocates (eg. Wickens, 1987) the novelty of the production system was found to be greatly overstated and to 'only superficially and rhetorically go beyond the social and political context of Fordism' (Garrahan and Stewart, 1990: 151). The idea that production is conflict free is rejected. Rather, it is argued the significance of the Nissan investment lies in the new forms of self-subordination of the workforce. The rhetoric of teamwork and TQC is invoked in order to create competition between individual operatives. Although dissatisfaction with this system exists among the workforce, it rarely translates into organised and coherent opposition to management. This reflects the 'marginalisation' of trade unions within the plant resulting from the single union deal agreed between Nissan and the AEU. On the other hand, the successful operation of this system is seen as reflecting the particular character of regional decline and

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[2]The low response level to their survey, however, plus the apparently fragmented nature of their findings, would appear to caution against the very claims they make (see Oliver and Wilkinson, 1988: chapter 4).

labour market conditions in the North East rather than the creation of a set of non-conflictual work practices.

Further support for the notion that Japanese plants in the UK are only limited form of 'Japanisation' is offered by Taylor et al (1991). They compare a Japanese owned consumer electronics plant in South Wales with a plant belonging to a leading 'emulator', Lucas Electrical. This study found that neither plant was particularly 'Japanised'. At the Welsh transplant systems such as JIT and TQC did not operate (although they do at Nissan - Garrahan and Stewart, 1989). Persistent problems remained in balancing output, throughput and quality - the very problems which are said to be resolved by JIT (see Chapter Two; section 3). Although the plant was characterised by quiescent labour relations this is seen more as a product of the gender division of labour and external market conditions than 'Japanese methods'. At Lucas, which is seen by some as an exemplar of 'Japanisation' (Oliver and Wilkinson, 1988; Parnaby, 1987; Turnbull, 1988), Taylor et al (1988) argue that such rhetoric has served as an ideological gloss for a set of more mundane changes. Where changes are occurring they are in the direction of the modularisation of production rather than JIT or TQC.

Taylor et al, conclude that the ideological role of 'Japanisation' needs to be carefully considered. Elsewhere, I have attempted to do this (Tomaney, 1991) through a review of Japanese manufacturing investment in North East England. In the case of the North East, Japanese investment has taken many forms and has had varied effects, and this belies attempts to speak of the 'Japanisation of British industry'.

Official and media accounts, however, stress the extent to which all the North East investments are characterised by 'flexible working'. Also, in all cases, Japanese plants are characterised by either absent or severely limited forms of trade union representation. My study shows how in the pronouncements of government ministers, 'new' Japanese working practices have been contrasted with 'old', conflictual patterns of industrial relations in the region's traditional industries (coal, steel, shipbuilding, see Chapter Five). For instance, the present Secretary of State for Trade and Industry, Peter Lilley has ascribed the decline of the old industries to 'militant trades unionism' and its attendant 'restrictive practices', with these factors disproportionately concentrated in the 'older industrial regions', which in turn have been characterised by 'an excessive concentration of union power' (quoted in Tomaney, 1991). The promotion of Japanese investment, through the use of regional policy, has been designed to address this situation. Claims concerning 'Japanisation' of the region's industry, therefore, must be seen in the context of the transformation of the regional political economy, both materially and ideologically, away from 'old' unionised, high wage industries to 'new', low wage, assembly oriented industries characterised by 'flexible' work patterns (see also Tomaney, 1989).

In short, debates about Japanisation have had a strong ideological flavour glossing over a more limited reorganisation of work practices along less dramatic lines than those suggested by the enthusiasts. In contrast, the ideological use of the term 'Japanisation', in particular its deployment as 'solution' for the 'restrictive practices' which are said to

have characterised British manufacturing industry, is probably of greater significance.

In contrast to writers grouped around Marxism Today, and the supporters of the 'Japanisation' thesis, Hirst and Zeitlin (1988; 1989) argue that the UK is still 'locked into the mass production paradigm', but that it needs to and can go down the route of flexible specialisation. Britain's failure to develop similar strategies to those in Japan is seen as reflecting certain 'institutional rigidities', which reflect poor management practices, past attempts by governments to promote increases in firm size as means to achieve scale economies, and also the legacy of restrictive practices by the trade unions. Although Hirst and Zeitlin suggest that the 'decentralised corporation' represents one response to the new competition, they are unequivocal in their proposals for industrial renaissance, which centre on the creation of industrial districts of small artisanal firms of the type which are said to characterise the Third Italy (Hirst and Zeitlin, 1988; cf. Chapter Two, section 3).

This analysis, however, is problematic. Firstly, the ascription of the competitive failure of UK manufacturing to the continued dominance of 'mass production paradigm' fails to address (let alone incorporate) that vast debate which identifies a long term decline in the UK's industrial performance. Moreover, it ignores an important branch of that debate which suggests that British manufacturing is distinguished by the relative underdevelopment of Fordist production processes and institutions. This body of work suggests that British industry did not

modernise along Fordist lines in the inter-war period and instead was characterised by extensive use of craft labour (see section 5 below). Piore and Sabel (1984) the pioneers of the the flexible specialisation thesis argued that countries with surviving craft industries would be the most likely to develop flexible specialisation (see Chapter Two, section 3). Hirst and Zeitlin offer no explanation of why flexible specialisation has not developed in the UK when the conditions for its adoption seem favourable. In fact, they uncritically accept arguments about the adverse impact of 'restrictive practices', when these could be taken as evidence of the enduring craft practices which are said to be the foundation of flexible specialisation.

Secondly, the promotion of a small firm solution to manufacturing failure does not take into account the relative domination of the UK manufacturing sector by multinational companies which are important players in the market and which dominate in the areas of technology transfer and skill formation. As Nolan and O'Donnell (1991) note, it is the strategies of such companies which increasingly account for the particular character of the UK economy in the contemporary European context, that is, as a low wage, low investment and low productivity economy. The failure to address these questions of history and the particular position of Britain in the international division of labour, seriously weakens Hirst and Zeitlin's approach, which assumes that all countries (and regions and industries) can adopt the strategy of flexible specialisation. Their approach is voluntaristic and policy

driven, i.e. serious analysis of real changes is subordinated to policy proposals for small firm development[3].

The post-Fordist accounts fail to capture the nature of workplace change in Britain in all but the most superficial ways. The 'New Times' and 'Japanisation' theses describe a dramatic and radical departure from past (Fordist) industrial practice, while the proponents of 'flexible specialisation' argue no real changes have occurred and Britain remains trapped in a Fordist past. The explanation for these divergent accounts of contemporary industrial change arise from the attempt to conceive of recent restructuring in Britain in terms of the Fordism/post-Fordism dichotomy. There is a large body of evidence to suggest that Britain was never stereotypically Fordist, or, at least, was Fordist in only limited ways. Indeed, it is argued that Britain's poor

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[3]British interest in flexible specialisation reflects partly the influence of this perspective on the policies of the former Greater London Council. The GLC's industrial arm (GLEB) sought to promote a strategy of flexible specialisation in London through investment in small firms (GLC, 1985: chapter one; Robin Murray, 1985). Public investment in these firms was dependent on commitments to improve working practices in the direction of the Italian stereotype advanced by Sabel. However, a subsequent autocritique admitted that GLEB's approach was fatally weakened because it 'did not have a coherent strategy for tackling transnationals' (MacIntosh and Wainwright, 1987: 259). Among other things this meant that the initiatives of small firms were often stifled by large manufacturers and retailers. Nolan and O'Donnell (1987, 1991) suggest further that flexible specialisation in practice failed to appreciate the tensions of working in and against the market. Although posing as a radical critique of the 'free market' policies of the Conservative government, GLEB's strategy of promoting production for niche markets was essentially elitist because it failed to resolve the question of how production could address real unmet needs (cf. Clarke, 1990). This in fact was in conflict with the GLC's wider social aims. Underpinning the GLEB approach was the assumption that through niche marketing there could only ever be winners in the competitive process - a view which I criticised in the previous chapter.

industrial performance reflected the enduring presence of craft-type labour practices and the forms of workplace trade unionism to which these were related. By the 1980s, the 'British disease' had come to be defined as a problem of 'restrictive practices'. It was this view which was adopted by the state and, therefore, informed state-led restructuring practices. In large measure, this accounts for the particular character of restructuring in Britain.

The 'post-Fordist' accounts lack of historical insight is a crucial factor in its failure to grasp the character of contemporary restructuring, because processes of restructuring and technical change cannot be understood in abstraction from the historical and geographical traditions of industrial practice in which they are deeply embedded. To ignore history and geography is to fetishise the process of change. The discussion which follows, therefore, attempts to specify the particular character of British industrial development. In particular, the argument that British industry did not develop along Fordist lines and that, therefore, the present period cannot be understood in terms of the transition to 'post-Fordism', is examined. The post-Fordist accounts outlined above, in different ways, all exhibit a concern with 'restrictive practices' or trade union 'demarcations'. Japanisation is proposed as a solution to 'restrictive practices', while for Hirst and Zeitlin, such practices serve to obstruct the birth of flexible specialisation. This concern represents an important connection between the debate concerning Fordism/post-Fordism and the parallel debate concerning the role of the Thatcherite 'productivity miracle' in overcoming the 'British disease'. Tracing through the significance of

'restrictive practices' in both rhetoric and practice helps to illuminate the nature of contemporary workplace change in Britain, in ways which transcends simple dichotomies. This is the task of the following sections, which aim to provide an historical account of the pattern of workplace change in Britain as a means to understand the particular character of contemporary workplace change. This account begins with an outline of the dominant claims concerning the 'British disease' and the 'productivity miracle'.

3. THE BRITISH DISEASE AND THE THATCHERITE 'MIRACLE'

The view of Japanisation held by Peter Lilley (described above) remains interesting insofar as it reveals something about the dominant conception - or at least rhetoric - concerning the nature of the economic crisis in Britain and the appropriate responses to it. Analyses of the relatively poor post-war performance of the British economy has been heavily informed by the notion that economic decline has been caused by the 'restrictive practices' of trade unions. In an influential book, Hayek, writing at the turn of the last decade, formulated the view that the 'powers of trade unions' were 'the main reason for the decline of the British economy in general' (1984: 52). He went on to argue that:

> The chief instances of such legal powers are intimidatory picketing, preventing non-members from doing particular jobs such as 'demarcation' rules, and the rule of the closed shop...Such practices have substantially reduced the productivity potential of British labour generally (Hayek, 1984: 53)

Arguments such as these were the inspiration behind, among other things, the reform of trade union legislation, which were designed to create the conditions for profitable production in Britain. The 'productivity miracle' in British manufacturing during the 1980s is attributed to the effects of this legislation (eg. Hanson, 1991; Metcalf, 1988)[4].

A more developed position argues that the sclerosis of British industry reflects the economy's heritage in the area of industrial relations, but more in terms of the type of industrial relations rather than the level of trade union membership. The combined impact of highly differentiated markets, legal immunities for unions, fragmented and small scale employers and strong craft union traditions, led British manufacturers to emphasise payment-by-results bargaining, with control over demarcation and effort intensity shared with workers in a less capital

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[4]Leaving aside for one moment the nature of this 'productivity miracle', the economic effects of industrial relations legislation since 1979 are far from clear. Legislative issues have been concerned principally with outlawing the closed shop, limiting picketing, the removal of trade union 'immunity' from prosecution (i.e. the equivalent of the right to strike in other countries) and the requirement to ballot members over strike action and political activities. Strike activity and union membership indeed have fallen. While the removal of strike immunities may have had some limiting effect on union activities (beyond a small number of high profile sequestrations of union funds, such as those of the NUM in 1984/5) and the ballot provisions may have limited rapid strike action, the case that they have had a major impact on union activity remains to be proved. Decline in strike activity (and falls in union membership levels) have been a feature of all advanced industrial countries. This suggests wider economic factors have been more important in securing relative worker quiescence in the 1980s (see Brown and Wadhwani, 1990).

intensive production system (e.g. the influential article by Crafts, 1988; also Elbaum and Lazonick, 1986; Lewchuk, 1986; Zeitlin, 1980).

This approach, it is said, contrasted with the needs of 'Fordist' forms of production which were supposedly being generalised during this period (i.e., strict managerial control over work effort, day wages and collective bargaining, under a clearly defined managerial hierarchy designed to exploit large scale plant efficiently). Following the second world war, the advantages of standardisation and mechanisation began to increase. However, in Britain, managements granted concessions to workers in the early post-war period in order to secure short-term industrial reconstruction. Such concessions served to entrench the operation of job controls and craft practices. Later, when competitive pressure increased the need for rationalisation efforts, managements ran up against the strength of worker resistance[5].

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[5]This argument has had wide appeal. Significantly it has been adopted by the OECD: 'Restrictive work practices appear to have been more serious obstacles to enhanced efficiency than in many other member countries. Rigid demarcation lines between different crafts have been a feature of work organisation in Britain. Strict separation between types of jobs at times meant there were several hundred job titles in large plants. This system invited bottlenecks to slow production and thereby lower productivity. A different aspect of restrictive work practices has been the prevalence of excessive manning levels in some production processes as a result of unions attempting to maintain employment levels in declining industries or industries where new technology offered significant scope for labour saving' (OECD, 1988: 66). As supporting evidence for this contention, the OECD cite a comparative study of production processes in similar plants in Britain and Germany which suggested that long delays in repairing machines in Britain could be attributed to rigid demarcation between operational and maintenance workers.

Crafts argues that post-war governments, also, were reluctant to address the productivity problem through trade union legislation, 'perhaps through fear of destroying the 'post-war settlement'' (1988: 10, see also Metcalf, 1989). The unprecedented power of workers and unions forced governments into uneasy alliance with organised labour in order to limit inflationary tendencies, thus avoiding a necessary restructuring of union power and the employment relation:

> For as long as cooperation was pursued as a solution to the changed bargaining power of organized labour there was a major obstacle to attempts at reforming industrial relations in pursuit of a system more conducive to productivity growth. (Crafts, 1988: 10)

Donovan (1968) advocated a cooperative solution to this state of affairs, arguing that many labour problems were caused by the disjunction of the formal structure of industry level bargaining and the informal, fragmented nature of workplace bargaining. Accordingly, 'proposals for the reform of collective bargaining are therefore fundamental to the improved use of manpower' (Donovan, 1968: 85). Donovan encouraged a move to single employer bargaining, especially through the adoption of productivity deals:

> ...a genuine productivity agreement offers solutions to many of the typical problems of industrial relations. It raises the standards of supervision and of managerial planning and control. It closes the gap between rates of pay and actual earnings. It permits negotiations on performance. It enables demarcation difficulties to be eliminated or reduced. It concentrates decisions at the level of the company or factory. It formalises and regulates the position of the shop steward (1968: 84).

Donovan provided a model of rationalisation and modernisation and there is evidence of a growing 'formalisation' of industrial relations from the late 1960s and rationalisation of structures (through the introduction of

measured day work and productivity agreements). However, while these efforts were complemented by state sponsored concentration and centralisation of production (see Massey, 1984), debate has concentrated on the 'failure of reform'. The argument that reform 'failed', firstly, because it took place in a hostile environment and, secondly, because it served to formalise bad practice, has been synthesised by Metcalf (1988). He argues, on the one hand, that Donovan was destined to fail because governments continued to give 'state handouts' to companies with product market difficulties, in particular, to 'monopolised, unionised, male-intensive industries like coal, steel, cars and ships' and 'any pernicious effects on productivity may have filtered outwards' (1988: 6,7; cf. Hanson, 1991). Moreover, the use of incomes policies meant that productivity-enhancing changes in working practices leading to wage increases were more difficult to negotiate. Also, labour market interventions such as the Fair Wage principle and Wages Councils helped to militate against fundamental reform. On the other hand, the growth of 'formalisation' in the 1970s occurred in a climate which was favourable to unions:

> Procedural and substantive rules, which were on the increase, may have built-in rigidities. The self-confidence of officials, stewards and workers (as compared with management) may have caused the frontier of control to be stabilised incorporating restrictive custom and practices. Formalisation often meant management concessions rather than being a vehicle to greater cooperation and higher productivity (Metcalf, 1988: 8).

Accordingly the Thatcher governments are distinguished by their rejection of cooperative solutions to the control of inflation and the underlying productivity crisis (Hanson, 1991). The resulting reform has given 'management an opportunity to control restrictive practices,

to obtain faster productivity growth and to assert control over the productive process' (Crafts, 1988: 16)[6]. In a number of ways the policies of the Thatcher governments created conditions which have contributed to a fundamental reform of industrial relations which has led to a 'productivity miracle'. Productivity has risen often through 'concession bargaining' or more far-reaching 'flexibility agreements'. At the same time productivity has risen faster in the (expanded) non-union sector, reflecting 'the greater use of 'managerial prerogative over the organisation of work' (Metcalf, 1988: 14-5).

According to this argument, Thatcherism altered the context in which bargaining occurred by effecting changes in labour markets, product markets, bargaining structures and by launching an assault on corporatist institutions. The principle labour market change was the creation of mass unemployment, as Metcalf puts it: 'high levels of redundancy and unemployment overlay the re-arrangement of the labour market'. In addition, however, the labour market interventions 'buttressing union power have been undermined', notably through the abolition of the Fair Wage principle and the weakening of Wages Councils. Legal constraints on unions make their operation more difficult. In product markets high exchange rates forced businesses to become more competitive. Competition was encouraged through deregulation in industries like television; privatisation and contracting

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[6]This has been complemented 'by an attempt permanently to dismantle the postwar settlement through seeking to erode Labour's power base' (Crafts, 1988: 16). This took the form of privatisation, council house sales, rates reform, educational reform, and so on (cf. Clarke, 1988a).

in the public sector also encouraged improved working practices; and 'where nationalised industries remain subsidies and borrowing limits have been slashed'. In collective bargaining, multi-employer arrangements are less common and negotiations are more frequently conducted within a single firm. The state corporations have led the way with moves to decentralised bargaining, performance-related pay and the rejection of traditional negotiating machinery. Nationally the traditional institutions of 'corporatism' - NEDC, HSC, ACAS, etc - have been marginalised or ignored (Metcalf, 1988: 16-17; cf. Hanson, 1991).

This account of both the 'British disease' and the Thatcherite success in tackling it has gained wide acceptance. Moreover, acceptance of this argument extends into sections of the Left. For instance in a recent article Leys (1991) has defended the 'New Times' analysis of Marxism Today - particularly as advanced by Stuart Hall - arguing that Thatcherism was the only available political solution to the crisis facing British capitalism, and that the 1980s have indeed seen a major productivity breakthrough. However, the version of economic history on which this perception is based can be criticised on a number of important counts. This makes it is necessary to reassess the claims for a productivity miracle and to examine in detail the nature of change in manufacturing in the 1980s. In the following sections I offer, firstly, a different interpretation of the nature of the post-war economic problem and, secondly, a reassessment of the nature of the productivity miracle and the workplace change which underpinned it. One of my aims is to

highlight the role of the state in this process and, to that end, I discuss in more detail events in the nationalised car industry.

4. TRADE UNIONS AND THE BRITISH DISEASE

Accounts which assign trade unions the primary role in the incubation of the British disease neglect the extent to which from as early as the the 19th century, but certainly thereafter, British capital preferred investment abroad to a greater extent than its main competitor countries. Sohn Rethel (1978) argues that, in general, faced with a crisis of accumulation and declining rate of profit during the Great Depression, the advanced capitalist countries tended to adopt one of two strategies depending on the particular constraints facing them: either they opened up new territories and expanded markets abroad or they intensified the rate of exploitation at home. The first strategy recommended itself easiest to 'rich creditor countries' like Britain; the second strategy recommended itself to the United States, 'still a debtor country, but rapidly advancing in industry and with the world's highest wage level'. These latter conditions propelled the development of 'scientific management'.

By way of support for this argument, Clarke (1988a) maintains that Britain's relative industrial decline reflected the ability of British capital to retreat into protected imperial markets in the face of successive world crises. While this was crucial to Britain's economic, social and political stability, it reduced the pressure to apply new technology, develop new products and introduce new methods of

management. It also limited the tendency to monopolisation and to the integration of productive and financial capital which proceeded at a much faster pace in the USA, Germany and Japan. A low rate of investment meant that British manufacturing industry carried a relatively light burden of external debt and depreciation and so could continue to make profits so long as revenue covered current costs, further reducing pressure to monopolise industry and transform production methods. The relative stability of production methods and forms of corporate organisation meant, among other things, that British companies still often relied on 'primitive' methods of management, with little direct managerial control of production processes. This conception of British economic history suggests both that British industry neither developed along Fordist lines and, that industrial development was hampered less by widespread restrictive practices than by low levels of investment.

What, then, was the impact of job controls? Job controls do have their origin in the rejection of the detailed employer direction of production which was central to the craft identity of early trades unionism. Also, it is true that they have been far more extensive in Britain than in other advanced industrial countries, but there is no simple relationship between the historical existence of job controls and the failure of British manufacturing to modernise along Fordist or post-Fordist lines. As Hyman and Elger (1981) show there is a more general explanation for the persistence of 'unscientific management' and the extension of job controls to non-craft groups in British industry: job controls can serve

the interests of capital by reinforcing workers' commitment to profitable production.

For instance, the existence of the gang system in the Coventry engineering and car industry is seen as an extreme application of job controls by shop stewards. In the car industry the gang system did have advantages for workers in terms of improved wages, control of work and the mitigation of work pressures. However, at the same time the combined operation of the gang system and that of piecework renumeration facilitated demanning. The key features of shopfloor control, it seems, were bargained or autonomous steward regulation of manning levels, the negotiated movement of workers between jobs and steward control of overtime rotas. Stewards did pursue reduced work pressures in order to sustain distinctive principles of fairness and need and the operation of these 'restrictive practices' was central to the development of solidarity and collectivism, but the constraints imposed on management were limited and often involved self-supervision (Hyman and Elger, 1981). Such arrangements were encouraged by management as forms of 'responsible autonomy' (Freidman, 1977). Even where extensive craft controls existed these did not lead to rigid or static 'restrictive practices' and could in fact contribute to productivity, both through the restraint of 'disorder' and through the standards of workmanship which the craft tradition promoted (Hyman and Elger, 1981; Edwards and Terry, 1989). In practice job controls were not necessarily established against sustained managerial opposition: 'They grew out of situations in which no one was 'in control'. They reflected

and reinforced traditional unplanned ways of doing things' (Edwards and Terry, 1989: 219)[7].

Important explanations for the poor productivity performance of British industry, which tend to be overlooked in the dominant accounts, lie in the character of management strategy and patterns of manufacturing investment which reflected Britain's emerging position in the international division of labour. Clarke (1988a), for instance, has described the strategies of the British state as 'Keynesian' (i.e. concerned with demand management) in order to distinguish them from 'corporatist' ones (i.e. concerned with planned reorganisation of industry). In general, forms of state intervention were limited. Even the nationalised industries suffered from this half-hearted intervention, being under-invested, with prices kept down, and strategy subject to short-term considerations (Clarke, 1988a; Fine and Harris, 1986; also Chapter Four). The poor productivity performance of British manufacturing corresponded to the relative backwardness of the industrial structure and continued foreign investment (often through acquisition) by British companies. Moreover the British economy increasingly stood out as 'a specialist producer of relatively low technology, low value added products and as a low wage, low

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[7]Hyman and Elger also note the relative fragility of the job control gains made by workers. In relation to the car industry they argue: 'Workers' gains in terms of wages and conditions were not entrenched in widely ratified agreements but were sustained through defence and elaboration of 'custom and practice' on a piecemeal basis' (1981: 134). Thus, in contrast to other countries, there were few legal constraints on employers, particularly in relation to the hiring and disposal of labour (Nolan and O'Donnell, 1991).

productivity, low investment economy' with 'a comparative trade advantage in low research intensive industries, such as food, drink and tobacco' (Nolan and O'Donnell, 1991: 112; see table 3.1). By contrast the dynamic, technology intensive sectors (such as cars, electronics) have been increasingly dominated by multinational companies which tended to locate low value-added activities in Britain (e.g. Fine and Harris, 1986; Nolan 1989a, 1989b; Nolan and O'Donnell, 1991).

The particular character of the British economy in the post-war period has been reinforced increasingly by the strategies of multinational companies. International producers historically have been less likely to commit themselves to concession making. In the car industry, for instance Ford consistently sought the most intensive work rates and the least constrained managerial deployment of labour across their international operations, making it much more difficult for Ford workers to establish the job controls of the type found in the West Midlands. A corollary of this, as Hyman and Elger (1981) note, is the nature of the investment associated with this approach to work organisation. Ford's investment in Britain has tended to be more labour intensive rather than elsewhere: 'Thus corporate strategies little encumbered by worker resistance, and informed by such factors as wage levels and the supply of skills and experience are of central importance in explaining the form and extent of capital investment in the UK' (Hyman and Elger, 1981: 137). Nolan and O'Donnell (1991) cite Ford's former personnel director as arguing that, in the post-war period, Ford consciously elected to situate its least capital intensive assembly operations in Britain, while in countries such as West Germany - where the institutional and legal

context of industrial relations militated against cheap and readily disposable labour - it was forced to implement more advanced production techniques. Arguably this is what underlies the high-wage/ high-productivity virtuous circle there (cf. Chapter Two).

Job controls were, therefore, not unimportant, but existed in this wider context. Clarke, thus, offers a general assessment of the impact of job controls on industrial performance:

> Although workers' resistance has frequently been cited as a major cause of low productivity, it was far more common for employers to milk old plant dry and refuse new investment demanded by the trade unions than for unions to resist investment plans outright. However, the ability of workers to prevent the employers from unilaterally dictating the terms of such investment made re-equipment less attractive, and made even many modern plants less productive than their equivalents abroad, where workers had been forced, or persuaded by real and sustained wage increases, to intensify their labour (1988a: 293; cf. Goodrich, 1921: 202-216).

It is in this context that subsequent shopfloor reform efforts - which according to Edwards and Terry (1989) were widespread by the late 1960s and early 1970s and which were given ideological legitimacy by Donovan - generally failed to secure their promised end of increased productivity and and greater formalisation[8]. Hyman and Elger (1981) argue that whatever the historical conditions of decline, by the beginning of the 1980s an offensive against the shopfloor

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[8]Attempts to modernise British manufacturing are usually seen as a response to the balance of payment crises of the 1960s which led to the formation of of the NEDC and later, under Labour, to the National Plan, the Department of Economic Affairs and later still the IRC and Min Tech. In fact the efforts to modernise British manufacturing in the post-war period could be seen to stretch back to the Anglo-American Productivity Councils of the 1940s which aimed to promote 'scientific management'.

counter-culture seemed essential to key sections of capital in order to secure international competitiveness. By the early 1980s the rhetoric of 'restrictive practices' had become ideologically central 'in the implementation of the law of value; in the definition of socially necessary labour time in the terms most advantageous to capital' (Hyman and Elger, 1981: 138). It is against this history that the claims of those who see Thatcherism as representing a radically transformative period in British economic and social history should be measured. Seen from this point of view, the Conservative governments of the 1980s seem a less radical departure from the past than the Marxism Today account would suggest. The Thatcher governments came merely to accept what was the widely held view that the industrial problem as one of labour practices and excessive trade union power. 'Thatcherism', however, was distinguished by the vigour with which it sought to subordinate the position of labour within production. This view of the industrial problem underpinned the restructuring of the 1980s to the extent that the state was able to influence its direction. In the following section, therefore, the particular character of the 'productivity miracle' is analysed. Subsequently, the role played by the state in directly influencing the nature of change through the provision of a 'demonstration effect' is analysed.

5. THE REORGANISATION OF WORK IN THE 1980s

> 'Britain has got the cure...they used to talk about us in terms of the British disease. Now they talk about us and say 'Look come to Britain and see how Britain has done it',
> Margaret Thatcher (quoted in Nolan, 1989a: 81n)

A review of the process of industrial relations reform, work reorganisation and technical change in industry in the 1980s, undermines both the claims of the post-Fordist writers, those who profess to identify a productivity 'miracle', and those, like Hirst and Zeitlin, who argue that no real change has occurred.

The British experience suggests significant changes are occurring. However these are based on a set of connections between market changes, technology and work practices, which are often at odds with the ascribed features of 'post-Fordism'. An example is Chris Smith's research in the food sector which found efforts directed at restructuring work organisation and undermining job demarcations occurring with the move toward fewer products. Moreover:

> 'Flexibility has little to do with extending skills or worker satisfaction, and a lot to do with undermining the remaining areas of craft control in maintenance, extending managerial authority over labour mobility and ensuring greater utilisation of expensive capital equipment' (Smith, 1989: 214).

If British developments seem modest in relation to those which define flexible specialisation or Japanese industrial practice, they tend to be concerned with the ends of restructuring identified in Chapter Two, namely an attempt to eliminate the 'unproductive' aspects of the production process. For instance in their review of major flexibility agreements, Incomes Data Services (IDS, 1986) identified the broad principles underlying changes in work practices as concerned with the elimination of idle time in production (downtime, waiting time and so on) and increased rates of machine utilisation. These general aims are reflected in the comments of the Director-General of the Engineering Employers Federation:

> 'We need to make maximum use of plant and machinery by eliminating restrictive practices, by having full flexibility between and within trades and occupations and between supervisor and supervised...[and]...in order to make better use of plant and equipment our member companies need to be able to adopt flexible working times when required (quoted in Wickens, 1987: 41)[9].

In contrast to the dramatic picture of change painted by Marxism Today, Elger's (1990, 1991) reviews of the mass of case study and survey evidence from manufacturing suggest a more limited piecemeal pattern of workplace change. Elger charts a relative shift in the direction of horizontal job enlargement rather than multiskilling, for instance. Equally, this trend has the effect of intensifying work through a reduction in the porosity of the working day. Such changes are said to reflect the relative vulnerability of labour, rather than fundamental shifts in strategy on the part of management. There is, moreover, no simple connection between technical change and work reform. Where technical change has occurred in manufacturing it has been largely assimilated into pre-existing patterns of industrial relations and occupational organisation, with a bias against high trust polyvalent team-working, notwithstanding any properties of the technology that might suggest the value of such reforms (cf. Jones, 1989). According to Elger, the weight of evidence suggests a variety of limited shifts in patterns of competence and control within and between different

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[9]Attempts to restructure inter-craft demarcations have been seen in the same way. A survey of managers in fifty British companies found that: 'The major factor causing the blurring [of demarcations] is economic pressure to reduce lost production through breakdowns, labour costs, and as a result of changes in the technology of the machines' (Cross, 1985: 69: see also Tomaney, 1990).

occupational groups, with some examples of deskilling but more of modified variants of limited but specialist expertise. The more general pursuit of task flexibility reflects diverse and incremental attempts to reduce manning levels and to increase the flexibility of work allocation, often through the erosion of job controls. This can have varied implications dependent on sectoral and establishment considerations but usually involves job enlargement with only modest extensions of competence and grading. This lays the basis not for multiskilling but work intensification.

This evidence would appear to undermine both the post-Fordist argument and the claims concerning a 'productivity miracle':

> Recent productivity gains do not stem from a fundamental reorganisation of the forces of production in Britain, but instead are the product of a series of step-by-step changes dictated by short term aims and perspectives (Nolan, 1989: 101).

For Nolan the process of restructuring in manufacturing during the 1980s continued the comparatively low-wage, labour intensive bias of the post-war period[10]. The productivity gains of the 1980s reflect the interaction of output recovery and continuing job loss since 1982, a

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[10]Williams et al (1990) add further weight to this argument and see the restructuring of the 1980s as contributing further to the 'hollowing out' of British manufacturing. Their analysis of a sample of company reports from British multinationals emphasised a retreat from competitive markets and expansion in production abroad rather than investment in manufacturing at home. British companies, they argue, perform badly in product development. For Williams et al these processes are exemplified by the activities of Hanson, plc., which has stated publically its preference for sheltered, low-tech businesses which are slow changing and do not require major investment.

relative shift in power at the workplace, and the kind of limited technical and work-related changes which Elger describes.

In the British case, restructuring generally has not been accompanied by large scale technical change. In particular investment levels have not been high and hardly warrant discussion of the emergence of a new 'industrial paradigm'. Haskel and Kay (1990) have shown that investment remained low during the 1980s and the capital stock did not grow faster than in previous periods (see Table 3.2). Estimates of total factor productivity, therefore, show the same performance trend as movements in labour productivity (Haskel and Kay, 1990; cf. Bean and Symons, 1989). One authoritative source concluded:

> Stronger labour productivity growth has not been linked to capital investment, which, in fact, has remained lower relative to GDP than in other recovery periods. Rather it seems linked to changes in work organisation with inflexible and outdated job demarcation giving way to more rational job allocation. This would appear to indicate that a large part of the observed growth rates in the 1980s are in fact successive level changes as opposed to underlying growth rates (OECD, 1988: 79)[11].

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[11]Nolan's (1989b) analysis shows that between 1979-85 total factor productivity grew faster in Britain than in France, West Germany and Italy. If the relevant point of comparison is Britain's record before 1973, however, the figures are less favourable. Thus, he argues, one plausible explanation of this record is that Britain began to recover from the effects of the world-wide economic crisis and recession of the 1970s and, in consequence, has seen a return to the underlying (and uncompetitive) productivity trend which prevailed in the the 1960s and early 1970s (see Table 3.3). Nolan's analysis is all the more impressive because it is based on a comprehensive review of the mass of material written on this complex subject and because it is informed by a critique of the productivity measurement exercise.

Moreover, Britain's retraining and skill formation policies remained among the most limited in Europe. This issue was noted by the House of Lords Committee on Science and Technology in their report on the training requirements of new technologies published in 1985:

> Technological progress in the UK is being hampered by the failure to develop the human resources of the nation...At stake is the UK's competitive edge in international trade and ultimately therefore the UK's economic future...The Committee doubts whether there is a more serious challenge facing British industry than the inadequate provision of people properly qualified and trained to exploit effectively the new technologies as they emerge (quoted in Ashton et al, 1989: 150)[12].

Thus, Nolan argues, to the extent that productivity improvements reflect the 'fear factor' (Metcalf, 1988) or a new spirit of 'individualism' (Richardson and Wood, 1988) within the workforce they may prove to be short lived. While accepting that labour productivity has increased, Nolan rejects the idea of 'miracle':

> The problem with such terms is that they encourage writers to speak misleadingly of an enduring 'trend shift' in supply side conditions, when in fact what they are merely describing is a new, and intrinsically fragile, power shift arising from the exceptionally brutal conditions of the early 1980s (1989b: 115).

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[12]Exact international comparisons are difficult to make, but according to a major EC survey, 38 per cent of persons in the UK are engaged in skilled work compared to 80 per cent in France, 67 per cent in Germany and 63 per cent for Europe as a whole (Special EC labour market survey, European Economy, Supplement B, September 1989). Ashton et al's (1989) history of the the government's training policy shows a progressive withdrawal from direct training provision through a combination of expenditure cutbacks and privatisation. This process reached it zenith with the introduction of employer-led Training and Enterprise Councils which are mainly an ideological investment in the rhetoric of an enterprise economy (see Amin and Tomaney, 1991; Hague, 1991). The British government was the only one in Europe not to support the EC's recently proposed £59m training programme (The Guardian, 6.6.90)

These conclusions seem reasonable on the basis of the evidence reviewed here, but they require qualification in one crucial respect. Terry (1989) argues that the pattern of concession making by unions and workers may have handed a more long term advantage to management by enmeshing unions in the long term struggle for competitive success. The narrowing of bargaining agendas and the acceptance of competitiveness arguments raise new issues for workplace organisations. Elger's review of case study evidence from the motor vehicle industry - focussing on the relative shift from a confrontational approach involving an ideological and real attack on 'restrictive practices' to a more 'Japanised' one - would support this argument. Elger argues that 'the first may have served as a transitional moment of coercive restructuring on the way towards the emergence of the second, involving the more active orchestration of flexibility and consent' (Elger, 1991: 60; also Holloway, 1987).

It seems clear - for instance, through the comments of Peter Lilley cited earlier - that for the present government at least the direction of change should be in the direction of 'Japanisation' described in section 2. To the extent that government in the late 1980s has been able to influence the direction of change it has promoted this scenario. The direct role of the state in promoting a particular pattern of restructuring would appear to be a distinguishing feature of the British case and is examined in more detail below.

6. THE STATE AND RESTRUCTURING

A key way in which the state - and specifically the Thatcher governments - has sought to influence the direction of change has been in relation to state-owned industry. As Willman and Winch suggest:

> It might be supposed that governments, particularly those explicitly intending to introduce innovative economic programmes, would seek to set out an example in those institutions over which they exert financial control. If, in addition, those institutions have previously confirmed the party view of trade unions, then it may be supposed that steps could be taken to ensure these parallels continue (1985: 189).

The 'productivity miracles' in companies such as BL/Rover and British Coal have been key elements in the construction of the argument for the overall success of the Thatcher governments in arresting economic decline. Transformations in workplace relations in the state owned industrial sector have been far more dramatic than those occurring in the privately owned sector[13].

Most studies of workplace change in the 1980s have focused on changes occurring in privately-owned manufacturing. However, the direct role played by the state in the process of workplace restructuring is of

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[13]Haskel and Kay (1990), for instance, suggest that the pace of reform has been particularly marked in those industries which were publicly owned in 1979...There was a marked break in trend around 1982/3 when the privatisation programme began, and the growth of productivity over the latter period has been strong across the sector. It is notable, however, that performance has been strong whether the industry was privatised or not (1990: 10; see Table 3.4)

crucial importance. The Thatcher governments have professed a general hostility to state ownership. For commentators on the Right a deeper significance is attached to the reform of such companies because all the failures of British manufacturing - especially in relation to 'restrictive practices' - existed on an exponentially larger scale in the state owned industrial sector despite the reform efforts of the 1960s and early 1970s (Metcalf, 1988; see Tomaney, 1991)[14]. For these reasons events in the state controlled sector require close investigation[15].

While the assault on job controls and the trade union organisation which underpinned them gained added edge from the presence of a particularly hostile Tory government, the concern with reforming industrial relations has longer antecedents. Awareness of the long term nature of the restructuring process in the nationalised industries helps to avoid a fetishisation of the activities of the Thatcher governments and the extent to which these represent a radical break with past industrial policy and practice in the UK. In some ways, as I hope to show, the activities of the Thatcher governments were merely an intensification of a developing tendency rather than a sharp

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[14]There is more than a measure of truth in this. In relation to BL, for instance Scarbrough argues: 'Shop stewards in BL were effectively organised and more powerful in their own right than any similar group in the rest of British industry, and despite management's hopes MDW [Measured Day Work] had done little to erode their power' (1986: 97).

[15]The state also provided this demonstration effect through the changes which it orchestrated in the public services (see Fairbrother, 1988), but which are not discussed here.

discontinuity with the past. For this reason my interest is more with the activities of the state than the Thatcher governments per se.

The role of the state in framing the nature of the industrial problem in the UK and the characteristic response to it is highlighted by the case of BL[16]. In the car industry, from the middle of the 1970s, ownership of BL guaranteed an important role to the state in the restructuring process. Increasingly, in relation to BL, state intervention took on a particular form:

> In the role of crisis management state interventions have deployed the rhetoric of 'restrictive practices' to attack shopfloor organisation and working conditions, the transformation of which has been made a condition of state funding to make good the meagre investment of the post-war years (Hyman and Elger, 1981: 138).

In the car industry generally, restructuring in the 1980s saw significant changes in the direction of tightening control over the allocation and intensity of labour reflecting the erosion of job controls and limits on the activities of stewards. These reflected the search for reduced costs and viable forms of lower-volume production, but took place against a background of job loss and plant closure and often the introduction labour displacing technology. Uneven movements in the

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[16]This discussion is included not least because of certain parallels with developments in the coal industry over the same period and which are examined in the subsequent chapters. The similarities should come as little surprise when it it is recollected that Ian MacGregor (later the NCB's chairman during the 1984/5 miners' strike) was appointed to the board of BL at the behest of its then chairman Michael Edwardes (Edwardes, 1983). According to MacGregor's testimony, it was during this period that he first diagnosed the British disease as a surfeit of union power and management weakness (MacGregor, 1986: 59-84).

direction of craft and operator flexibility were also important (Elger, 1990; Lyddon, 1990; Marsden et al, 1985). However, developments at BL stand out because changes were implemented through a managerial offensive which inflicted a severe defeat on shopfloor organisation. For Elger (1990) restructuring at BL represented a 'distinctive moment' in the wider restructuring in work and employment in motors. Arguably the significance of events at BL - given the publicity which they were accorded - were not lost on workers in manufacturing more generally.

At BL the progressive loss of markets in the 1970s posed a major problem for governments because of the centrality of the company to the British manufacturing sector. Both the Ryder report and the National Enterprise Board saw the reform of labour relations as central to any restructuring. Ryder proposed a product-led restructuring aimed at winning back market share through an expansion of production. The key element in this was to be the development of the Metro. The Ryder strategy acknowledged the prevailing distribution of power in the company by recommending the development of industrial democracy, emphasising the need to achieve the cooperation of and commitment of shop stewards in improving BL's performance, particularly by reducing the number of official disputes and improving continuity of production. The participative approach to change centred on stewards' attempts to negotiate payment for change in the tradition of mutuality (Willman and Winch, 1985, Scarbrough 1986).

Thereafter, the central feature of the reform of collective bargaining within BL was the passage from joint commitment to change, to a

position in late 1979, after the election of the Tories, where management were prepared to impose changes in work practices unilaterally once agreement could not be reached (Willman and Winch, 1985). This approach was embodied in the person of Michael Edwardes who sought to regain what he termed 'the sine qua non of survival... the right to manage' (quoted in Scarbrough, 1986: 104). Edwardes shared with Ryder the desire to see continuity of production but his means to achieving this end were significantly different. This approach precluded negotiation of change based on the 'buy out' of restrictive practices (Edwardes, 1983). Thus:

> By November 1979 BL management were engaged in all-out attack not only against such 'restrictive practices', but also against the work-place organisation which sustained them (Scarbrough, 1986: 106).

The centrality of the Metro to the restructuring strategy meant that events at Longbridge, where it was to be produced, had special significance, not least because of the particular choices management made in relation to the new production system. The modernisation of the plant began in 1977, during the post-Ryder period, which meant change was subject to negotiation. Although primarily oriented to strategic goals of volume and cost, management sought to build into the process a greater degree of control over production (Scarbrough, 1986; Scarbrough and Moran, 1985). The machinery chosen (particularly in the advanced Body-in White shop) was a relatively inflexible form of automation geared to high production volumes. Above all such technology, operated under stringent financial conditions and deteriorating market circumstances, demanded in heightened form the continuity of production which Edwardes wanted. At Longbridge a

change in the pattern of labour relations was required and, while there were shifts over time in the conceptualisation of the desired change, the outcome was consistent with a broader pattern of restructuring:

> The decision was to invest in capital rather than labour: to go for high-volume production: to require greater flexibility of labour between routine unskilled jobs and faster workpace (Willman and Winch, 1985: 63).

According to Scarbrough (1986) this form of automation tended to transform social control of production into an abstract, built-in feature of the production system. Moreover, at Longbridge new technology was used to break down forms of work organisation based on groups (the traditional basis of the gang system) into smaller numbers of isolated individual workers: 'This tactic alone could increase operator efficiency by 10 per cent or more' (Scarbrough and Moran, 1985: 208)[17].

The capital intensive nature of the system meant that particular attention was devoted to the question of maintenance requirements. Although management wanted to erode the greater part of the trade's autonomy and to erode demarcations, they did not tackle the trades head on. Instead they used new technology to manipulate 'the technical and political margins of the trade's work' (Scarbrough, 1986: 111). Specifically, the abstract electronic and programming skills associated with computer controlled robot systems in the Body-in-White process were expropriated for a new managerial 'control engineer' grade.

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[17]I will show that there were striking resonances with the pattern of change at Longbridge and those which occurred in British Coal (especially at Selby) - see Chapter Six.

Complex tendencies of skilling and deskilling were at work within the establishment of an overall hierarchical division of labour.

At Longbridge, the design of work practices coincided with Edwardes' more general drive for management control which precluded experimentation with the 'humanisation of work'. Under Edwardes BL evolved a package of reforms in a document known as the 'Blue Newspaper': which involved extensive changes to mobility, industrial engineering and mutuality (Willman and Winch, 1985) and which, in the face of fragmented and uncoordinated union opposition, management unilaterally implemented in April 1980. The threat of dismissal faced any possible rejection of the terms by the workforce. Longbridge management used the broad reform package to introduce measures which they saw as necessary for the successful operation of the plant. Mutuality was ended, manning levels and work standards became the prerogative of industrial engineers, Works Committee members were deprived of their semi-permanent status, leaving only the convenor and his deputy as full-time officials and, according to Willman and Winch (1984) stewards control over the effort bargain was reduced[18].

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[18]It is clear, however, that the type of work process introduced at Longbridge did not follow directly from nature of the technology itself. A similar technical system had been introduced at Saab's Trollhatten plant accompanied by extensive 'humanisation' efforts, involving team-working and extended cycle times. The production process at Longbridge was characterised by a comparatively small workforce, with a high proportion of skilled maintenance staff (to ensure continuous production) and a number of extremely short cycle jobs on direct work (Willman and Winch, 1985; also Berggren, 1989). Pontusson contrasts BL's approach with Volvo's: 'Whereas Volvo represents a prototypical case of industrial innovation through bargaining and collaboration between

(Footnote Continued)

The role of government and the fact that BL was state owned was crucially important in accounting for the dramatic nature of restructuring at BL. At first, through the NEB, the state helped to frame the problems of BL as being derived from shopfloor disorder. Later, the laissez faire attitude of the Tory government (and the worsening financial position of the company) helped to strengthen management's position. Moreover, at key points in the restructuring process Edwardes was able to threaten mass dismissals or the liquidation of the company. As Scarbrough notes, however:

> It was only in the particular circumstances of the late 1970s, and especially the government's adoption of a policy of disengagement, that such threats became perceptibly real - allowing management to exploit the power inequality inherent in the employment contract as a weapon against the collectivities of workers (1986: 108).

The changes at BL have been more dramatic than those which have occurred elsewhere and provided a powerful 'demonstration effect' for manufacturing industry but the limits to this change should also be acknowledged. The forms of technical innovation were limited. BL's productivity miracle has been much remarked upon but both Scarbrough and Willman and Winch suggest that it has not been based on a technical breakthrough but arises from the reform of working practices. Moreover, while the level of industrial action at BL fell in the mid-1980s

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(Footnote Continued)
management and labour, BL represents a prototypical case of innovation conceived by management and imposed on labour' (1990: 312). This 'neo-Taylorist' approach (cf. the discussion of Lipietz's typology in the previous chapter) reflected political choices by management. This is exemplified by the comments of a manager in the powertrain shop at Longbridge in relation to the Machine Monitoring System, an electronic information gathering system, the purpose of which he described as 'to look for the idle buggers' (Scarbrough and Moran, 1985: 49).

it was not eradicated. 'The miracle of Longbridge' reflected 'primarily a shift in power and intensification, rather than any more radical transformation of work relations' (Elger, 1991: 61) and provided fragile foundations for continued industrial development.

7. CONCLUSION

This chapter has demonstrated that post-Fordist analyses have little explanatory purchase in the British case, whatever their merits in explaining events elsewhere. The difficulties (and dangers) of attempting to subsume the complex patterns of contemporary restructuring in a single account of change have been highlighted. This chapter has argued that rather than measuring the development of British industry against an ideal model of capitalist development there is a need instead to emphasise the force of institutional and social conditions which operate differently in various advanced economies. Post-Fordist accounts of change, on the other hand, are representative of a particular theoretical approach which searches for a 'pure' form industrial production:

> They involve taking an abstract concept of particular features of the ideal country, separating them from the complex historical circumstances in which they have developed and assuming that they could, in principle, have been adopted in a similar form in Britain (Fine and Harris, 1986: 13).

The many empirical examples which are not readily classifiable as post-Fordism are seen as somehow residual, i.e. as regions or industries which must (or will) catch up with new forms of production organisation which are being imposed by the new economic rationality. Alternatively, lagging regions and industries are viewed as pathological

exceptions: they are relegated to the status of 'discordant facts' (Chris Smith, 1989). However, diversity and unevenness are inherent in the process of change. The tendency of post-Fordist writers to see developments in terms of an immutable logic determined by responses to market conditions, ignores the fact that firms and economies are rooted in specific historical contexts and, that processes of restructuring are mediated expressions of strategies, conflicts and compromises reflecting national, sectoral, corporate and other conditions. As Elger (1990) notes, such positive accounts of change are buttressed more by polemical and overdrawn contrasts rather than a true appreciation of the complex and equivocal forms of restructuring which have occurred.

Furthermore, the notion that 'Thatcherism' has fundamentally altered the direction of industrial development, still less provided the conditions for the emergence of post-Fordist society, has been questioned. While there is little evidence that Thatcherism has burst asunder the integument surrounding a putative post-Fordism, important changes have occurred which should not be underestimated. While inspired by the timeless quest of capitalist enterprise to secure further time and control economies in production, British firms have pursued limited forms of restructuring in the 1980s. To the extent that it is possible to generalise, it seems clear that these have been aimed largely at reducing production time losses often through the erosion of demarcations. However, firms have not been concerned with laying down the foundations of a 'post-Fordist' labour process, but, instead, have acted to effect more limited changes largely in response to the changed balance of class forces prevailing in 1980s Britain. Thus,

there is little evidence that this restructuring, in any way, has laid the foundations for a renewal of British industry[19].

This is hardly surprising given the limited, even banal, conception of the British industrial problem held by important sections of the political establishment. The example of BL, in particular, highlights the role played by the state in formulating the nature of the industrial problems and the response to it. Also, the case of BL shows that it is necessary to distinguish between the political contingencies which dominated the state sector and the market contingencies which dominated the private sector (cf. Elger, 1987). In the 1970s, the prevailing balance of forces in the industry and the wider balance of class forces militated in the direction of corporatist solutions to the productivity problems. Later, under the Conservatives, with corporatist solutions discredited and the threat of mass unemployment and the withdrawal of state support hanging over the company, a more combative managerial approach was made possible. It is striking that

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[19]'Thatcherism' (CPGB, 1989) is in many ways a 'chaotic conception' (Marx, 1973: 100). It ascribes to the Conservative governments a political cohesion which they rarely exhibited. Also it tends to suggest a radical break in the practice of the state when important continuities also existed. In particular, the low wage, labour intensive bias to restructuring which marked the post-war period has not been altered. Nevertheless, to the extent to which the policies of the 1980s can be said to have contained an essential notion, it is of the necessity of subordinating the position of labour within production (and indeed within society more generally). As Clarke puts it: 'While Keynesianism was the ideological expression of the attempt of capital to respond to the generalised aspirations of the working class in the post-war boom, neo-liberalism is the ideological expression of the subordination of working class aspirations to the valorisation of capital' (1988a: 86).

the concern with labour indiscipline was embodied in the technological choices which management made.

It was within this broad pattern of British restructuring that events within coal were played out. Coalmining has been seen both as the virtual embodiment of the 'British disease' and as central to the restructuring of the 1980s (Metcalf, 1988; MacGregor, 1986). At least one key management figure in the coal industry saw his mission in almost 'post-Fordist' terms:

> No longer could we survive as labour intensive economy. Instead we had to begin the slow and painful change to a capital-intensive economy. The change was imperative. There was no way to stop the inexorable tide...Attempts to resist it can only result in a bigger bang when the pressures finally break through to a new and different economic balance. It was my job to try and manage the change - to be a sort of midwife to it - in such a way as to ensure it caused the minimum of discomfort (MacGregor, 1986: 64-66).

For Ian MacGregor, up until the late 1970s British society in general had still failed to grasp the changes which were occurring in the world economy. Nowhere was this more true than in the coal industry where managers cowered in the face of union power:

> If ever an industry suffered from the collection of maladies many had come to associate with the British problem, it was coal as it entered the 1980s (ibid: 125).

Chapter Four then outlines the nature of technical change and the transformation of work in the coal industry. Specifically, it addresses MacGregor's arguments, that, firstly, restructuring reflected broad technical changes which were affecting companies in general and that, secondly, the particular pattern of change was influenced by the prevailing view of the nature of the British disease. However, in order

not to fetishise change, contemporary events are set in their historical context. The chapter concludes, however, by offering a detailed account of the programme of technical change initiated in the 1970s and the extent to which this was overlain by extensive restructuring of work practices following the defeat of the 1984/5 miners' strike. The differential outcomes of these processes and events in two seperate coalfields are examined in Chapters Five and Six.

TABLE 3.1

Labour Costs in Manufacturing, 1960-86

	Total hourly labour costs					
	1960	1970	1980 (UK = 100)	1982	1984	1986
USA	296	250	126	158	194	161
Japan	30	57	80	86	109	129
France	94	105	121	110	114	122
West Germany	98	144	165	147	153	173
Italy	72	113	108	104	117	127
Belgium	94	122	176	142	140	149
Netherlands	N/A	126	160	142	142	156
Norway	113	150	153	152	163	164
Sweden	138	181	170	142	147	154
UK	100	100	100	100	100	100

Source: cited in Nolan and O'Donnell (1991: 113).
Note: Labour costs are compared at current market exchange rates.

TABLE 3.2

Investment and Capital Stock

	1969-73	1973-79	1979-82	1983-89*
Investment/GDP	0.22	0.21	0.18	0.20
Capital Stock in manufacturing (growth p.a)	3.29	2.54	1.59	0.80

*Investment data up to 1989, Q2
Capital 5o 1987, Q4

Source: CSO, cited in Haskel and Kay (1990).

TABLE 3.3

Total factor productivity growth in manufacturing (hourly).[a]

Average annual percentage change.

	Pre-1973[b]	1973-9	1979-85
USA	2.6	0.4	2.4
Japan	6.9	2.4	4.4
France	5.4	3.0	1.9
West Germany	3.6	2.8	2.0
Italy	5.6	2.1	1.6
Belgium	6.6	5.0	3.7
UK	3.3	0.0	2.3

Notes: a) Output is added at constant prices.
b) The starting years are as follows: USA, 1960; Japan, 1966; Germany, 1961; France, 1964; UK and Italy, 1960; Belgium, 1962.

Source: OECD Economic Outlook, December 1987; cited in Nolan (1989b: 104).

TABLE 3.4

Total factor productivity in UK public sector

	Annual rate of increase (per cent)		
	1979-88	1979-83	1983-88
BAA	1.6	0.0	2.8
British Coal*	2.9	0.6	4.6
British Gas	3.3	-0.2	6.2
British Rail	1.3	-0.4	2.7
British Steel	12.9	8.4	12.4
British Telecom	2.4	2.0	2.5
Electricity Industry	1.4	-1.6	4.0
Post Office	3.7	3.6	3.3
Average	3.7	1.6	4.8

* adjusted for effects of 1984/5 strike

Source: Haskel and Kay (1990).

CHAPTER FOUR

THE TRANSFORMATION OF WORK IN THE BRITISH COAL INDUSTRY

1. INTRODUCTION

This chapter outlines the post-war history of the labour process in the nationalised coal industry. The chapter seeks to place restructuring in coalmining, firstly, within the discussion of 'post-Fordism', and, secondly, within the specific context of industrial restructuring in 1980s Britain.

The British coal industry provides an interesting case for exploring the significance of the post-Fordist thesis. In Chapter Two I criticised those theoretical approaches to the understanding of contemporary workplace change which claim that current forms of restructuring amount to a radical break with past forms of industrial practice. In particular I criticised those approaches which identify a terminal crisis of mass production brought on by the application of microelectronics. I argued instead that such theories appear to point to a set of more limited developments in the organisation of industrial production around flow principles. The application of microelectronics (and other process innovations) in production reflects the intensified search for time and control economies which is a historical characteristic of large scale industry. Thus, although important innovations are occurring in production organisation and control, in many ways these represent a deepening of an older capitalist imperative. The discussion of the

historical development of coalmining in this chapter is an illustration of this argument.

Restructuring in industry such as coalmining is of interest also for reasons arising from the discussion of the British case in Chapter Three. Under the Thatcher governments, the view that the 'British disease' had its origins in excessive union power in the workplace, manifested in the operation of job controls became paramount. Moreover, the political response to the industrial problem became concerned with altering the balance of power between management and unions within the workplace and within society as a whole. The case of coal illustrates well this general argument. Using Elger's terminology, restructuring in coal can be seen as 'distinctive moment' in the broader industrial restructuring of the 1980s. As I noted in the last chapter, employees and unions in the state sector have tended to face more sustained management pressure for restructuring than those in private manufacturing. BL, for instance, seen to embody many of the key features of the 'British disease' and has since been seen as a metaphor for successful industrial restructuring. The recent history of the coal industry has been presented in a similar light. Metcalf, for instance, chooses to title his celebration of the 'productivity miracle' of Thatcher's Britain, 'Water notes dry up'. He suggests:

> Water notes are issued in coal mining to permit a miner to cut short his shift if his clothes are wet. Sometimes in the recent past they were issued when the 'the conditions were as dry as the Sahara' but no longer. Although coal is not part of

manufacturing, the changes in this practice seem to capture the spirit of the times (1988: 27-28)[1].

The recent history of the coal industry neatly demonstrates the significance of this interpretation of the industrial problem and the changing balance between technical and social responses to industrial efficiency limits.

The chapter begins by outlining briefly the forms of work and technology which the nationalised coal industry inherited. The chapter shows that traditionally the miner enjoyed a high degree of workplace autonomy. Early attempts at mechanisation are outlined. Although these were limited, it is shown how, at the time, these were seen as attempts to 'Fordise' coal production. The chapter then charts the mechanisation of longwall mining in the nationalisation era and illustrates the extent to which this aimed at creating 'flow production' underground and how the work process was subject to certain of the features of 'scientific management'.[2] Despite these changes miners

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[1]The facetiousness of this remark is offensive to miners who work in conditions considerably more dangerous and unpleasant than those of the London School of Economics. A water note is often little recompense for a shift spent working in freezing black sludge.

[2]'Scientific' production methods were propagated alongside increased mechanisation, for instance, by the US Coal Commission in the inter-war period. Carter Goodrich, with characteristic insight, noted: 'Even the most 'progressive' mine of today is very far indeed from the extreme of the 'Ford methods', but one prominent superintendent declares that just such a degree of regimentation can be attained as soon as a sufficiently automatic cutter-and-loader can safely be driven down a longwall face, and another argues for a standardization of 'every operation down to the minutest detail so that no responsibility of any kind will fall on the worker''(1928: 155).

continued to regulate their work, retaining a probably unprecedented degree of control over the work process. Mechanised coal production (called 'powerloading') was widespread by the 1960s, but the productivity improvements associated with its introduction were disappointing. A set of production problems emerged which bore a similarity to the 'crisis of mass production' outlined in Chapter Two.

The chapter shows how a series of technical improvements to powerloading were proposed, with an important role ascribed to the potentialities of microelectronics in ensuring a high rate of machine utilisation. These innovations were introduced progressively from the end of the 1970s and amounted to a qualitative development of the production process. In one sense, this might be taken as evidence of of the emergence of a 'post-Fordist' labour process, but also reflected a deepening of the existing tendencies toward an integrated flow production. Again, the innovations did not result in the expected rise in productivity and by the early 1980s the productivity problem in coal increasingly came to be defined as a problem of labour relations.

The chapter charts the general productivity improvement in the post-strike period and suggests it is a consequence of the complex interaction of the alteration of working practices in ways designed to increase the utilisation of new technology. The restructuring process at BC was also as an attempt to bring labour practices into line with a long term pattern of technical change. BC's deteriorating market position added to the pressure for altered work practices which, according to most accounts, were imposed unilaterally by management.

Notwithstanding the putative 'post-Fordist' aspect to restructuring, the chapter shows, therefore, that actual pattern of restructuring from the 1970s owed much to the 'British model' of restructuring outlined in chapter three. First, although the primary direction of technical change was toward reducing unit cost through higher output and reduced machine time losses, it seems that increased managerial control over labour was built in where possible. This was particularly the case when labour practices were seen to be a cause of production losses. However, the practical impact of such technologies on the workforce, particularly on skills, have been a subject of controversy. The question of the impact of new technology on the workforce remains an empirical one and is dealt with in the following two chapters. Second, despite the increasing capital intensity of the production process, there is no evidence that management sought new accommodations with labour in order to ensure its optimum utilisation (because managerial faith had been already placed in the capacities of information technology to achieve this end). Instead the reassertion of 'management's right to manage' became the dominant rhetoric. In fact one aspect of the miners' strike was not only a defeat for the NUM but also for those factions of the national level management who were opposed to this hardline view and the emergence, in their place, of a cadre of managerial militants.

If this account bears a striking similarity to the interpretation of events at BL outlined in the previous chapter, in one important respect, this should not be a surprise. A key figure in the restructuring of both companies in recent times was Ian MacGregor. MacGregor was a board

member at BL, drafted in by Michael Edwardes (Edwardes, 1983). MacGregor's experience there was crucial in defining his interpretation of the British malaise and the role in it played by labour (MacGregor, 1986: 59-84).[3]

2. WORK AND TECHNOLOGY PRIOR TO NATIONALISATION

During the period of rapid expansion of the coal industry through to the latter half of the nineteenth century virtually all coal was handgot. There were two principal forms of handgot mining: bord and pillar (or room and pillar method) and later longwall handgot mining. Bord and pillar mining predominated during the early development of the coal industry at the outcrop. Under handgot mining (or 'single place working') the collier completed the full range of getting tasks before loading the coal into tubs. Forms of industrial organisation were pre-industrial and capitalist forms of work and time-discipline were absent (cf. Thompson, 1967). The collier was paid according to piece-rates and supervision was minimal[4]. According to Goldthorpe:

> The colliers saw the supervisor simply as a watchman acting on behalf of the management and the law: so long as they worked in the right place and obeyed safety regulations, he

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[3]It is not my intention in this chapter to offer a comprehensive history of the macroeconomic developments in the coal industry of this period. To the extent that these developments form the background to the substantive matters of this chapter they are referred to only briefly. Also, I do not intend to comment on the detailed and Byzantine debates about the development of the labour process in the coal industry. As far as possible I follow lines of consensus in these debates.

[4]As Marx noted: 'Since the quality and intensity of the work are here controlled by the very form of the wage, superintendence of labour becomes to a great extent superfluous' (1976: 695).

> had no right to intervene: he had no direct role to play in the work of winning the coal...The deputy was rarely called upon to harass the men into greater efforts; he had no progress schedule to maintain (1959: 215-216)[5].

The entire system of handgot mining was seen as self-regulating. The tempo of production was slow and, therefore, did not require elaborate arrangements back-bye for getting the coal to surface. Despite the slowness of the tempo, all the aspects of production appeared to balance each other, while requiring a minimum of organisation and within the limits of what was technologically simple it was possible to realise the system's potential. Because the cycle of operations was self-contained, it was possible for production to take place over 24 hours on a three shift system. This meant that such overheads as did exist were in continual use[6].

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[5]Carter Goodrich (1921) reports a case arising under the Minimum Wage Act, when an overman was called upon to testify whether or not a miner did his work properly: 'Overman: 'I never saw him work.' Magistrate: 'But isn't it your duty under the Mines Act to visit each working place twice a day?' 'Yes.' 'Don't you do it?' 'Yes.' 'Then why didn't you ever see him work?' 'They always stop work when they see an overman coming, and sit down and wait till he's gone - even take out their pipes if its a mine free from gas. They won't let anybody watch them.' (Goodrich, 1921: 137-8). The putters, however, who supplied the tubs for the colliers, in some cases, were supervised more rigidly by the deputies in attempt to ensure that an adequate number of tubs was supplied to each place.

[6]Trist and Bamforth (1951) coined the term 'responsible autonomy' to describe the level of control enjoyed by the colliers under this system (cf. Friedman, 1977, who used the term in relation to the gang system in the Coventry engineering industry: also Chapter Three). Goodrich (1928) on the other hand, writing about handgot room and pillar methods in the US situation referred to the 'miners' freedom or 'indiscipline' and noted how factory foremen avoided employing miners when possible because of their attitudes to work.

To the extent that the task of regulating the production process was devolved to the miners themselves, in some cases, sophisticated and solidaristic mechanisms were developed to ensure equal chances to earn. Perhaps the most developed form of these job controls were the 'cavilling' and 'marra' traditions of the Northern coalfield. Because conditions varied throughout the pit, earnings were determined by the nature of the place each miner obtained. In order to prevent favouritism, and more generally to equalise the chances of good earnings, under the auspices of the Lodges quarterly lots were drawn to determine the allocation of stalls (see Chapter Five for further discussion)[7].

The nature of the late nineteenth century period of expansion of the industry determined the dimensions of the crisis which beset the industry in the period after the First World War. The expansion of output was determined largely by extending hours of work or reducing pay (via the sliding scale) rather than transforming the technical base of the industry. Although mechanisation gradually began to make an impact on the industry between the wars, levels of output per manshift failed to match those of the Britain's major competitors. Profitability remained highly dependent upon the relationship between wages and

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[7]Such principles were not restricted to Durham and Northumberland. In the USA the principle of 'square turn' was an equivalent egalitarian form of work allocation, ensuring that no man should have more mine cars (tubs) than any other. The underlying solidaristic principle was that every man ought to get a fair share of the work that was going (see Goodrich, 1928). In the southern British coalfields (e.g. Notts.) the more individualistic 'butty' system was the norm (see Chapter Five).

prices, because the former represented up to 80 per cent of production costs. As a result the competitive strategy of the British coalowners in the inter-war period relied to a large degree on driving down wages. This was the background to the General Strike and the the miners' lockout which followed it.

The beginnings of mechanisation did occur in the inter-war period, however, chiefly at the face itself. The principal developments were the introduction of undercutter machines and later of conveyors. By 1925 the proportion of output cut by machine had risen to 20 per cent, but this had little appreciable impact on productivity which actually continued to fall during this period (PEP, 1936). Costs of production, therefore, still largely reflected labour inputs and this fact underlay the employers' strategy of cutting wages and lengthening hours as a response to the competitive pressures building up on the industry (Reid, 1945).

Mechanisation of longwall mining before the Second World War failed to establish an upward trend in overall productivity despite increases in the proportion of coal mechanically cut. The amount of coal mechanically cut rose from 58.5 million tons per annum in 1927 to 142 million tons by 1939. Overall productivity rose to 22.47 cwts by 1933 but thereafter declined. An upward trend for productivity at the face was established during the 1930s. However, the number of coalcutters in use over this period increased only marginally, by 7 per cent (Reid, 1945). In part this increased performance can be attributed to better machine design and the 40 per cent increase in electrical horse power

which occurred over this period, but the major explanation for the change lay in the wider application of conveyors. The introduction of conveyors on a large scale, it was believed, allowed the more regular and consistent use of the coal cutters with mining methods which made fuller use of their cutting capacity and tended to generalise longwall mining (eg PEP, 1936; Reid, 1945). By 1939 58 per cent of total output was conveyed along the face, with conveyors increasingly used in the gate roads (Reid, 1945).

The introduction of conveyors made machine mining more economically viable, by making it possible to extend the length of the face. In addition the new longwall organised around the face conveyor had the economic advantage of reducing the proportion of development work (to make gate roads) in relation to the extraction area. The use of double and single unit longwalls allowed a bigger concentration of men to be engaged in the coaling process and in turn allowed a degree of concentration of workings within the mine. For Trist et al (1963) this system was 'expressive of the prevailing outlook of mass production engineering' (see also Trist and Bamforth, 1951).

Unsurprisingly, this innovation in the technological basis of coal production was accompanied by important changes in the organisation of work. Principally, the technical changes had the effect of eroding the basis of self regulation inherent in the single place tradition, where the collier conducted the full range of coal-getting tasks. The new process required distinct task groups and endowed the production process with a cyclical character. On a machine cut longwall, production occurred

over a three shift cycle lasting 24 hours. In the first (prep) shift the coal was undercut by machine; in the second (coaling, getting or tub loading) shift the coal was 'filled off' and timbers set to support the new roof area; in the third (advancing) shift, pulling (moving the conveyor forward) and caunchwork (ripping) were carried out[a].

In contrast to the previous, highly flexible system, machine mining was based on a increased division of labour and was beset by problems of coordination and regulation. Notwithstanding the potential for improved performance under this system, the cyclical character of production meant that any disruptions had reverberations throughout the 24 hour period. Goldthorpe noted the significance of the shift to partial mechanisation:

> No shift can begin its own work until that of the preceding shift has been completed. The deputy, and he alone in the district, has responsibility for the smooth running of the cycle. It is one of his most important functions to see that the work of the shift conforms to schedule, and that stoppages are kept down to a minimum, since even a small

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[a]Contemporary commentators stressed the deskilling aspects of mechanisation. Harold Heslop in his 'socialist realist' novel of the 'Darlstone' (Durham) coalfield wrote about the mechanisation of a face and its impact on work: 'Cameron watched him go. A skilled hewer, Bill Smith, he thought. A man who could get coal where another would surely fail, a man in whom was bred all the finest sense of the miner. And progress had decreed a change, so here he was, reduced from the proud eminence of the skilled craftsman of the pick to a mere shoveller. Any chap from London could do the same!...And if they could have looked across the centuries they might have experienced the sympathy of the old craftsman who were beholding a revolutionary change' (Heslop, 1934: 229). Although the beginnings of machine mining represented a qualitative development of the labour process (equivalent to the real subordination of the labour process - see Chapter Two), Heslop overstates the extent to which the miner had been rendered a 'mere' labourer or even equivalent to a Londoner (cf. Bamforth and Trist, 1951, who stressed the skills associated with partial mechanisation).

> hold-up can have a disproportionately adverse effect upon the operation of the production process as a whole (1959: 217).

A single shift no longer contained the complete coalgetting task, but was 'only a part of a scheme of production into which it has to be smoothly integrated' (Goldthorpe, 1959: 218)[9].

As the potential of mechanisation began to be revealed in the inter-war period the limitations of existing organisational structures and forms of ownership were also exposed. Increased capital intensity led to an increase in overhead costs and this created a new imperative to ensure a more efficient utilisation of assets. This imperative existed at the level of the individual enterprise and at the level of the industry as a whole. Increasingly contemporary commentators argued that chaotic patterns of ownership and control within the industry were incompatible with growing mechanisation. In particular, it was believed that amalgamations would lead to increased productivity by allowing the reorganisation of layout and haulage and the closure of mines not amenable to mechanisation. Such a situation would have allowed the

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[9]For Goldthorpe these changes amounted to the application of 'factory methods' or 'the Ford system' to coal production. The mechanisation of mining required an increase in supervision: 'Otherwise the cycle may be disrupted, output thus lost, and machines, representing comparatively high overheads, stand idle' (1959: 219; also Trist and Bamforth, 1951, for a certain similarity of argument). Heslop's novel offers contemporary testimony: 'Jack Cameron had arrived at the state besought by capitalism - a state of perpetual exploitation. Not a minute lost. Always going. The mine had been Fordized. They were turning out coal like they turned out cars, and almost as cheaply...He had allowed the boss to dictate a machine which in turn dictated their lives. They were producing coal with the facility with which Bloomsbury produces novels and plays' (Heslop, 1934: 229-30).

industry to reap the full fruits of mechanisation. Examining the situation Political and Economic Planning argued: 'There is little doubt that overhead costs are increased by mechanisation, and that mechanisation may not therefore be wholly successful unless accompanied by concentration of output' (PEP, 1934: 33)[10].

The wartime coalition government appointed the Reid Committee to investigate technical conditions in the industry 'from coalface to wagon' and they recommended a 'drastic technical reorganisation' (Reid, 1945: 1). The Committee's Report recognised the technical improvement which had occurred in the inter-war period, but identified at least two major problems facing the industry. First, it recognised that mechanisation had largely been confined to the coalface through the introduction of cutting machines and conveyors. (By 1945 72 per cent of coal was produced mechanically and 71 per cent of coal was conveyed mechanically along the face). Reid, however, noted that the introduction of conveyors had failed to raise substantially the tonnage handled per outbye worker, and the Committee concluded that

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[10]A series of official and semi-official reports drew public attention to the need for drastic reorganisation of the industry during the inter-war period (Sankey, 1919; Samuel, 1925; PEP, 1936) but these had little impact on the coalowners. The defeat of the miners in 1926 meant that the endemic crisis of the industry remained unresolved while all attempts to alter the structure of the industry in a manner likely to facilitate more rational production failed. The Coal Mines Act of 1930 responded to the crisis by organising sales cartels in an effort to restrict output and maintain prices. In addition the Act created the Coal Mines Reorganisation Committee which was invested with the task of bringing about amalgamations. In the event, as a test case in 1935 proved, the legal powers with which the Committee hoped to achieve its aims, were inadequate to the task.

arrangements between gate conveyors and the shaft bottom were inefficient. The haulage system could not cope with the higher levels of performance at the face which were being made possible by mechanisation. The second and related problem identified was that existing mines were often too small and badly organised to make the introduction of new haulage methods worthwhile. Therefore, the Committee recommended a programme of amalgamation, rationalisation and reconstruction of mines with the aim of creating larger units capable of securing economies of scale and more rationally planned production[11]. Although the Reid Report did not deal directly with the question of ownership its recommendations implied a radical alteration of the structure of the industry. The changes called for in the report implied some degree of state intervention to secure the desired restructuring.

3. NATIONALISATION, MECHANISATION AND INDUSTRIAL RELATIONS

The coal industry was nationalised on January 1st 1947. Powerful forces existed to bring about this change. Firstly, private ownership, through systematic under-investment, had clearly failed to produce a coal industry capable of competing with other industrial countries. Secondly, the miners' long campaign for the industry to be taken into

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[11]Reid's plan was for a rational, mechanised coal industry in which traditional miners' 'customs'- notably the limitation of the 'stint', cavilling, and the seniority rule - would be 'incompatible with modern mining practice' (1945: 117).

public ownership had made a compelling moral case for nationalisation[12]. By vesting day, however, it had become clear that the model of nationalisation would be the Morrisonian one. The prevailing view was that the organisation should be run on technocratic rather than democratic lines (for the controversies within the MFGB in relation to this debate see Coates, 1974; also Eldon Barry, 1964: 109-123).

The new National Coal Board was given the task of breaking even taking an average of good years and bad. This commercial orientation within otherwise unaltered capitalist market relations meant that for miners the experience of work remained virtually the same in the post-nationalisation period. The situation was exacerbated by the economic imperatives of the post-war period, when the pressures of post-war economic reconstruction led to a huge demand for fuel. This, together with the prevailing balance of payments crisis which prevented the importation of mining equipment, meant that large-scale technical change was postponed, and the emphasis instead was placed on extending existing systems and intensifying work practices[13].

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[12]Moreover, it was clear that the cooperation of the miners' unions in the post-war reconstruction exercise added impetus to the case. Given the weight of the MFGB (later NUM) within the wider labour movement, nationalisation had come to be seen as essential to the operation of a 'post-war settlement'. Nationalisation therefore represented an 'aspect of the institutionalisation of the balance of class forces in the post-war period' (Clarke, 1988b: 85).

[13]Despite the new forms of union-management consultation introduced under nationalisation, therefore, miners did not regard the underlying relations of production as having changed. Writing contemporaneously, Dennis et al (1956: 76-77), argued that such changes as had occurred 'have been unaccompanied by profound modifications in the general

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In the period after the War slow progress was made in extending machine mining and improving the back-bye infrastructure in ways which led to the better use of face equipment. This involved the gradual extension of the use of conveyors in gate roads; so that there was a doubling of the total mileage of conveyors underground to 1,734 miles between 1947 and 1953 (Fine and Harris, 1986). This type of mining was to remain the dominant form of coal getting until the 1960s, with a further diminution of handgot faces. Despite the growing level of mechanisation - between 1949 and 1955, as output grew, overall productivity rose only 6 per cent from 1.19t to 1.25t - there was no major breakthrough in levels of productivity, the reasons for which are addressed below.

The origins and significance of powerloading

Even as it was being introduced the limits of this type of partially-mechanised coal getting were being recognised. Most attention focused on the cyclical nature of face operations, especially the time consuming and non-productive task of dismantling the conveyor, threading it through the props and reassembling it, which was undertaken during the third shift. British mining engineers were increasingly made aware of the advances of their US counterparts in developing methods of

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economic framework of which mining is a part, or of the social structure within which miners exist...they saw no change in the local management of the mines when nationalization took place. In all these ways they see themselves opposed to the same forces as before nationalization'.

production which combined the activities of cutting and loading into a single system of 'powerloading'[14].

While it was clear that any advance in mechanisation had to occur along the axis of the conveyor-based longwall, there was much space for innovation within these parameters. The first in a series of technical breakthroughs which were to lead to the development of a system of powerloading, was the application in British conditions of the German invented armoured face conveyor (AFC). Built out of heavy steel, it comprised a series of short conveyor pans, loosely bolted together and connected to a drive unit and return unit in the face-ends. At intervals, on top of the pans, scraper bars were positioned and these were driven by chains. As coal was cut mechanically, it fell onto the pans and was pushed away by the scraper bars in the direction of the loadergate. The AFC was a major innovation in face technology which, despite improvements to the detailed design, has remained basically unaltered to this day. Its heavy steel structure allowed it to transport greater volume of coal and to allow a cutting machine to traverse the face while positioned on top of it (Harlow, 1977; Ashworth, 1984).

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[14]The first cutter-loaders, such as the AB Meco-Moore, did begin to lessen the cyclical character of face operations, but were limited to geological conditions of relatively thick, level seams. Within these limits the Meco-Moore began to have fairly wide application in areas such as the East Midlands in the 1950s. But, despite their advantages, the development of such machines did not address the fundamental problem of the need to reposition equipment in front of the props during the third shift. The AB Meco-Moore, therefore, while reaching a high point of application in 1957 when 165 machines were in use, gradually declined and virtually disappeared in the 1960s (Kelly, 1969).

This latter feature, according to Ashworth 'brought about an economy of lateral space in front of the face' (1984: 78). Moreover, because the metal pans were loosely bolted together 'the AFC could immediately be pushed up to the new line of the cut length of face which had not yet been cut' (ibid). A shortened version of the AFC was used in the face end as a stage loader to allow the loading of coal onto belts in the loadergate end-on rather than at right angles.

The new system required the space in front of the face to be free of obstruction, including props. A major advance occurred with the introduction first, of yielding props and later, and more importantly, of hydraulic props. These latter consist of two steel tubes which can be raised or lowered telescopically by hydraulic fluid. By 1956 some 400,000 hydraulic props had been introduced. Later hydraulic props were grouped together and supplied with power to make them self-advancing. In this system the supports are designed so that they ram forward the AFC as they are being advanced. According to Ashworth:

> The great achievement of powered supports was that the provision of support for the strata newly exposed by coal cutting, and the removal of the conveyor to the new line of the face, which used to take so much time and physical effort, could be accomplished with the use of hydraulically transmitted power while coal getting was still in progress (1984: 82).

The third shift task of advancing the conveyor, as it were, had been eliminated. A new degree of integration had been achieved in the organisation of the production process. As a consequence, the way was clear for winning coal on two or three production shifts per day instead

of one. Significant time economies were possible. According to one contemporary observer:

> Not only does three-shift working make more economical use of all the pit's capital equipment, but it greatly reduces the risk of those interruptions to production which are the bane of cyclical work, where no shift can begin work unless the work of the preceding shift has been completed. Furthermore, faces that can be worked continuously allow a pit to wind coal on more than one shift from fewer faces than where each face is on a cycle (much less expense is involved in working five faces for two or three shifts a day than in working five faces on one shift and five additional faces on a second shift). One great and final advantage of the new machines which eliminate handloading (and permit continuous mining) is that they allow coal-getting to be performed by relatively small work teams (Baldwin, 1955: 277-278, emphasis added. See also: Shepherd, 1951; Scott and Noble, 1954).

The transition to powerloading was completed with the widespread introduction of the Anderton Shearer Loader (ASL) as the principal coal cutter, which used a rotary drum with picks fitted onto its circumfrential surface to shear coal from the face (for detailed accounts see Kelly, 1969; Townsend, 1976; Ashworth, 1984; chapter 3). The ASL emerged from a range of competing models (such as the plough and trepanner). One of its main attractions was its suitability to being adapted to traversing the face while being mounted on a conveyor. The percentage of output which was powerloaded grew from just over 10 per cent in 1955 to almost 86 per cent by 1966/67 (see Table 4.1). The ASL itself produced over 50 per cent of powerloaded output by 1966 (and by 1977 it produced 80 per cent)[15].

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[15]Unlike previous forms of mechanisation, however, powerloading technology was geologically selective. It could only be applied in thicker seams and, therefore, contributed to closure pressures in the peripheral coalfields and the relative concentration of mining in the central coalfield. In my view, the contribution of technological choices

(Footnote Continued)

Additional changes occurring in other parts of the mine at this time were designed to complement those changes occurring at the face. The gradual replacement of rope haulage systems by conveyors was seen as essential to establishing the conditions which allowed the full utilisation of powerloading equipment by allowing the transfer of mineral 'by a single method in a continuous flow from the face to the surface and out of the colliery' (Ashworth, 1984: 98). Thus, the ASL, based on the critical component of the armoured face conveyor, supported by a belt based coal clearance system, provided the basis for a general mechanisation of mining which previous cutter-loader systems did not.

Despite this technological revolution some important limits to the full utilisation of the system quickly began to emerge. Although Reid (1945) had pointed out that technical developments elsewhere below ground had not matched those occurring at the face in the inter-war period, technical progress at the face outstripped that occurring back-bye for most of the post-war period. The failure to match progress at the face with progress back-bye had the effect of limiting the potential effects of the introduction of powerloading.

Also, at the time of nationalisation most tunnels and headings were driven using shotfiring and handloading. Throughout the 1950s and

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to the closure programme of the 1960s has never been fully analysed, although I do not intend to contribute to this discussion here. It should be noted, though, that the closure programme contributed to the destablisation of industrial relations in the industry which is analysed later in this section (see Renouf, 1990).

1960s some progress was made in mechanising face-end activities, so that by 1957 90 per cent of drivages used mechanical loading. Between 1953 and 1960 the average volume of material extracted per manshift increased by 76 per cent and the average rate of advance of tunnels by 76 per cent, even though the average cross sectional area was 30 per cent larger (Ashworth, 1984). Such improvements were not enough to prevent growing concern about the slow progress in speeding up face-end and tunnels drivages by the end of the 1960s. (Indeed it was only at the end of the 1970s that substantial breakthroughs occurred in this area).

Work practices, wages and industrial relations in the powerloading period

The qualitative rise in the level of mechanisation was accompanied by, and to some extent propelled, a reordering of work practices and payment systems. As already described, the mechanisation of coal cutting was concerned to a large degree with attempts to reform the shift system. From the management viewpoint, the move to powerloading gave new opportunities, and made necessary the need, for a restructuring of the social relations of production in ways consistent with growing capital intensity. The new pattern of rationalisation also allowed the questions of the industry's strike proneness and problem of wage drift arising from piecework to be addressed[16].

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[16]Fine and Harris (1986) argue that strike proneness and wage drift
(Footnote Continued)

The fundamental issue was raised, among others, by Trist et al (1963) who called for a 'machine-centred work culture', based on the recognition that productivity was determined less by human effort and more by machine performance. This gave rise to a heightened concern with lost production time:

> Recognition of the new value of time will fundamentally affect attitudes to all interruptions of the productive process - at any stage and through any cause (Trist et al, 1963: 260).

They even suggested a new basis for productivity based not on output per manshift but the proportion of actual to possible machine time. In recognition of these new realities, they also suggested the wider application of time based wages for face workers. Such a payment system came to fruition in the National Power Loading Agreement, introduced in 1966, which replaced piece-rates with a time based wage system (a form of measured day work) for all workers on mechanised faces. Negotiations over coalface wages were transferred from pit/area level to national level and face manning levels were to be determined by method study[17].

(Footnote Continued)
after nationalisation were not a direct product of the type of wage system, but rather of a generalised attempt to restrict wage rises. Arguably though, the pattern of disputes also reflected a tendency prevalent within coalmining for walkouts to occur as a prelude to negotiations rather than as a last resort. This tactic, in turn, had its origins in the pre-industrial forms of work organisation described earlier. It was certainly an issue which agitated managers in the period after nationalisation (Douglass, 1977).

[17]The incompatability of machine mining and piece work was seen as a truism by many 'progressive' mining engineers. Indeed as early as the 1920s it had been recognised by engineers and owners in the USA that 'machine mining is not piece work in the nature of it' (Coal Age, 24.7.24; quoted in Goodrich, 1928: 153).

Most studies of the NPLA have focused on its impact on wage structures (eg Searle Barnes, 1969; Handy, 1981; Krieger, 1983). These studies recognise that technical change in the 1950s, and the growing impact of powerloading was causing wage drift in piece rate lists and the introduction of District Powerloading Agreements. Such wage drift reinforced the NCB's determination to rationalise wage structures. While technical improvements occurred with increasing regularity in the 1950s giving rise to improved productivity, faceworkers, in particular, tended to respond to these changes by demanding upward revisions in local piece rates as a quid pro quo for acceptance of new technology, regardless of any productivity improvements (Krieger, 1983). Fine and Harris (1986), for instance, argue that often managements forwent the opportunity to make incremental technical improvements for fear of causing disputes. The period before the introduction of the NPLA was characterised by the constant battle on the part of management to keep down wage costs. The introduction of heterogeneous District Powerloading Agreements exacerbated these tendencies and did not contribute to the end of a rationalised wage structure (Kreiger, 1983). The NPLA, therefore, was an attempt both to rationalise the wage structure and to reduce the wage drift problem, through an acceptance of the principle of collective bargaining. The NUM itself accepted the NPLA as being in its long-term interest by eliminating regional differentials in pay which, it was argued, in turn were a function largely of geological accident, ie. under piecework good geology allowed good earnings because coalgetting was easier.

The other aspect of the NPLA, less often discussed, dealt with the issue of machine utilisation and work organisation. With wage negotiations removed to the national level, management expected to be able to concentrate their attentions at the pit level on improving production organisation. The general growth in machine mining had itself raised the possibility of higher levels of supervision because production was spatially concentrated. Fairclough pointed out:

> Supervision is more concentrated and, therefore, more effective. Less time has to be spent in travelling and senior officials can visit each working place more frequently. All tasks at the face are proceeding simultaneously on all three shifts and there is a better understanding and integration of the work as a whole (1960: 79-80).

As well as raising the possibility of increased supervision, a high level of mechanisation also demanded it. In theory, manning levels were now to be determined by pre-shift planning and specific jobs such as chocker, ripper and so on were to be replaced by a single 'taskworker'. The traditions of self-regulation (such as cavilling), about which Reid had complained in 1945, were to be eliminated (see Heath, 1969). Gradually method study was applied to work organisation and task assessment in an apparently self-conscious attempt to apply the techniques of scientific management to what was now a 'modern' industry (eg. Groonbridge, 1970)[18].

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[18]From the view point of wage structures the NPLA can be seen as a classic 1960s collective bargaining arrangement of the type advocated by Donovan (see Chapter Three). The NCB believed their agreement to be a path breaking one, and part of a movement which was modernising and rationalising manufacturing industry at this time. In its Report and Accounts for 1966/7 it argued the shift from piecework to day-wages represented 'a major advance which might well set a pattern for other industries' (quoted in Heath, 1969: 185). In fact Donovan referred

(Footnote Continued)

The level of supervision and the level of machine utilisation increased measurably in the period following the introduction of the NPLA. For instance, the ratio of officials to workers increased from 1:12 in June 1967 to 1:9.5 in July 1968 (Heath, 1969). This was in fact part of a longer term trend associated with the introduction of powerloading. Between 1958 and 1968 the ratio of officials to faceworkers increased from 6.5 to 4.5, an increase of 39 per cent. Moreover, among the increased number of underground officials a higher proportion were overmen, concerned with production chasing, as opposed to deputies concerned with safety (Allen, 1981: 92). Higher utilisation of plant, made possible by the shift to 'continuous mining', increased appreciably following the introduction of the NPLA. The number of longwall faces working three or four shifts increased by 18 per cent between March 1965 and March 1966. However, between March 1966 to March 1967, the first year of operation of the NPLA, increase was about 33 per cent (Heath, 1969)[19]. Rationalisation was clearly aimed at destroying the old autonomies of the miner which were seen as incompatible with machine mining and reflected the wider concern within British management about outmoded work practices (see Donovan, 1968; Chapter Three).

(Footnote Continued)
approvingly to the NPLA.

[19]According to Goldthorpe, for instance, under powerloading: 'It is the machine rather than the deputy or the miner, that sets the pace of operations' (1959: 225; cf. Chapter 2, section six). I argue below, though that this was true in theory only though, because of the unpredictability of the mining process.

Limits to progress with powerloading

From the foregoing it is clear that a transformation of the technical and social basis of coal mining occurred from the mid-1950s through the 1960s. The shift to mechanised longwall mining was an attempt to apply the perceived advantages of mass production engineering to the coal industry. By the end of the 1960s, the production system in the industry was based on a new economy of time and control based on powerloading, and was seen as the culmination of the shift from a labour intensive, self-regulating form of production to a more scientifically controlled, capital intensive one. This in fact was the end state to which the most 'progressive' mining engineers had aspired for some considerable time (see Goodrich, 1928; Reid, 1945; Anglo American Council on Productivity, 1951; Goldthorpe, 1959). The move to national collective bargaining in wages appeared to cap this process of modernised and rationalised structures (Krieger, 1983).

However, it became quickly apparent that the new form of production organisation brought its own problems. These were reflected in the failure of the new powerloading technology to achieve the productivity levels hoped for, and the emergence of new and apparently intractable problems of labour control and industrial relations. A productivity plateau emerged by the end of the 1960s which reflected the technical limits of mechanised mining (Figure 4.1). Ashworth summarises a fundamental difficulty which underlies the attempt to introduce factory like conditions into the coal mine:

> To a large extent the limitations and the contrast arise from the tension between the new technology and the conditions in

> which it has to be applied. A modern coalmine, using the most advanced technology available, with a face being worked quickly to produce a regular large daily output and coal moving all the way on conveyors from the face to the surface, looks much more like the continuous flow production industries familiar for decades in many types of manufacturing. In a sense, this is clearly the character towards which the coal industry was aspiring and moving. But it is a character that could not wholly be achieved. Quite apart from the hard physical conditions which must sometimes damage machinery and overstrain men, the operating conditions (unlike those in manufacturing) do not remain uniform and cannot be regulated into something near uniformity. The difference shows itself in the time when the running of machinery is interrupted in a coalmine and is not in an assembly line manufacturing industry. It also accounts for some of the continuing large need for labour in mining (1984: 118; cf. Douglass, 1977: 215, for a miner's view).

At the end of the 1960s, mining engineers began to address the problem of lost production time. At that time it was estimated that on most mechanised faces machine operating time averaged only three hours out of a seven and quarter hour shift. A survey of 66 mechanised faces showed that within the limits of the prevailing technology average face output could be increased by one third through the reduction of 'operational and ancillary time'; that is, time associated with repair, maintenance and machine turnarounds (Kelly, 1969; also Burns et al, 1985). Although the origins of many of the technical problems appeared to remain obscure at this stage, by 1980 the NCB were able to codify 526 mechanical delay faults. To this extent, the problems emerging in the organisation of the production process in coalmining could be said to reflect, in exaggerated form, the problems of coordination and integration which are alleged to have brought into crisis mass production industries around this time (equivalent in some ways to the so-called 'balance delay problem' described in Chapter Two).

The sources of delays in the production process were not only technical. The same survey mentioned above suggested that a further third of potential production time was being lost largely because of poor worker discipline. This category of delays was attributed to unskilled or careless operation of machinery, poor time-keeping and inadequate supervision (Kelly, 1969). Subsequently, the NCB reported the results of a study which showed how worker 'indiscipline' translated into lost production time (see Table 4.2).

Although many contemporary observers had feared that the NPLA and associated increases in the use of method study and higher levels of supervision would lead to the final erosion of the miners' historic ability to retain a high level of control over his own work pace it seemed that this was far from the case. Reid (1945) had expressed the belief that traditions of self regulation were incompatible with capital intensive mining, while for Trist et al (1963) traditions such as cavilling interfered with the rational production planning. The NCB expressed the view that the NPLA had 'considerably changed longstanding practices and habits'. However, it is clear that such intentions were not borne out in practice. In an article written originally in 1974, Douglass shows clearly how, despite the introduction of 'factory methods' of production, miners managed to retain a probably unprecedented degree of control over their own work (Douglass, 1977; see Chapter Five for a fuller discussion). Labour indiscipline began to be seen as a crucial part of the productivity problem and in this sense

the coal industry was no exception to British industry as a whole (see Chapter Three)[20].

A third dimension to the emerging crisis of the new powerloading technology lay in the changing pattern of industrial relations and strikes. One aim of the NPLA had been to eradicate the high level of strike proneness exhibited by the coal industry under the piece wage system. It was presumed that the large number of small scale strikes which reflected disputes over price lists and allowances would disappear because under the NPLA wage negotiations would be transferred away from the pit to the national level. To some degree this occurred following the introduction of day-wages. Equally, however, it seems a new pattern of local conflicts based on disputes over manning levels replaced the earlier disputes over price lists (Winterton, 1981; Fine and Harris, 1986). Some colliery managers regretted the removal of incentives made necessary by the NPLA which they felt led to workplace resistance and effort reduction (Kreiger, 1983; Edwards and Heery, 1989).

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[20]I address this issue in more detail in Chapter Five. Among other things, this illustrates how accounts which ascribe the high level of workplace autonomy enjoyed by miners simply to the physical conditions of the mine (and consequenty to the inherent problems of supervision) are misplaced. Carter Goodrich recognised this in the earliest days of mechanisation: 'It is the organization of the mine that determines how rarely a miner shall see his boss, but how he shall act when he does see him is also a matter of the custom of the trade and the theorations of the gob pile' (1928: 97-98). The 'miners' indiscipline', therefore was the result of collective practice of the 'gob pile democracies' not a simple function of darkness and isolation.

To the extent that wage negotiations had been transferred to the national level and local, regional and sectional differences had been reduced, the basis for unified national industrial action over pay had been created. This end was in one sense a by-product of the technical and social changes brought about by the introduction of powerloading and the NPLA. Yet, it was an end to which the political Left within the NUM had been aspiring since nationalisation[21]. It was on this basis that a series of large scale strikes began in 1969 with the surfacemen's dispute and culminated in the national strikes of 1972 and 1974. This new militancy, however, was not technologically determined. The growing radicalisation of miners, disillusioned by the experience of nationalisation, and the growing influence of a campaigning Left within the NUM were also important. Thus, the miners' strikes of the 1970s have been described as both reflecting and contributing to the growth of the 'mass militancy' which characterised this period of British political history (Rutledge, 1977) and which signalled a growing dissatisfaction with operation of of the 'post-war settlement' (Clarke 1988a: chapter 11). To this degree, the crisis of productivity and

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[21]The NUM had been committed to the concept of day-wages since the formulation of the Miners' Charter in the 1946. The Left within the union campaigned for the leadership to turn this policy into a reality and, to some extent, saw the NPLA as a long term victory. In the short-term, it posed serious political problems for the union as areas which had done well under the piece rate system had their wages pegged as areas with low piece rates caught up (Kreiger, 1983; Rutledge, 1977).

control which beset the coal industry from the end of the 1960s mirrored that occurring generally within British manufacturing[22].

4 PLAN FOR COAL: THE CONTEXT OF THE 1984/5 STRIKE

The position of the coal industry within the economy was transformed during the 1960s, partly as a consequence of market contraction, but also as a result of the technical changes of that period. Coal production now tended to come from large rationalised mines using powerloading techniques. The type of production system which had evolved was as close an approximation to the factory environment as could conceivably be achieved. This new arrangement brought with it its own technical problems and sources of conflict between management and labour. The conflicts of 1972 and 1974 highlighted the limits of the system which had been introduced and stimulated the pursuit of means to overcome these technical limits and to alter the social relations of production.

The combined processes of technical change and the concentration of production in areas which mechanisation suited, together with official promotion of alternative sources of fuel (oil, nuclear) which reduced the market for coal, led to the large scale pit closures of the 1960s.

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[22]See Slaughter (1955) for an account of the beginnings of the process of radicalisation. A further contributing factor to the radicalisation process in the NUM was the impact of the closure programme in the peripheral coalfields and the threat this posed to mining communities (see Renouf, 1990, for an analysis in relation to the Durham coalfield).

However, the coincidence of the 1974 miners' strike and the oil crisis and, on the back of important industrial victories of the labour movement, the election of a Labour government initially committed to a corporatist-type agenda led to a reassessment of the role of coal within the economy. The Plan for Coal, 1974, (PFC) allowed for the closure of ageing and inefficient mines but also for the shortfall to be made up by substantial investment, including the opening up of previously unexploited reserves, notably at Selby, on the assumption of expanding demand. The PFC also extended the consultative mechanism for bringing the unions into decision making. However, the onset of world recession, leading to a fall in the demand for energy, together with a fall in oil prices, meant the forecasts of expanded demand did not materialise. Moreover, the effects of rapid inflation meant that the costs of investment contained in the PFC rose rapidly from the end of the 1970s (Ashworth, 1984; Williams et al, 1986; Bailey, 1991).

The Labour government was forced to increase the funding of the PFC. A gradual shift in attitude accompanied the election of the Conservative government in 1979, which imposed a more stringent financial regime on the NCB and which underlay the strategy of eliminating high cost capacity[23]. The first attempt to achieve this in 1981 was abandoned

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[23]Although the financial regime was tightened under the Conservatives, in reality the process was begun under the previous Labour government. The previous regulatory regime for nationalised industries, as set out in the White Papers of 1961 and 1967, was loosely defined without clear areas of responsibility between government and corporation. The 1978 White Paper, The Nationalised Industries (Cmnd 3437), emphasised the primacy of financial targets, although, in
(Footnote Continued)

following strike action by the NUM. However, it is clear that from an early stage, central government had been planning for the possibility of a confrontation with the NUM and confrontation began to look inevitable (see Beynon, 1985; Renouf, 1990). The collapse in the demand for energy and increasing pressure from central government generated a financial crisis which allowed the NCB to play on ambiguities embodied within the PFC. The Board's vigorous interpretation of clauses on exhaustion lay behind the 1984/5 strike[24].

While these broader events were being played out two developments central to the labour process concerns of this thesis were also occurring. Firstly, important changes were made to payment systems,

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(Footnote Continued)
practice, external financing limits had been introduced in 1976. The White Paper placed increased emphasis upon the control of the corporations' profitability and returns on capital and corporations' cost efficiency. Efficiency audits were to be carried out by the Monopolies and Mergers Commission (see MMC, 1983; more generally see Molyneux and Thompson, 1987).

[24]The NCB's financial crisis had its origins in the PFC. During the 1960s a large proportion of the NCB's resources went into financing the extensive closure programme. The PFC attempted to rectify this by increasing government investment in the industry. However, because the PFC was financed through fixed interest government loans rather than equity, the NCB was burdened with high interest charges. By 1981/2 interest payments amounted to 10 per cent of the industry's capital liabilities and 7 per cent of turnover. This had two consequences. Firstly, it placed an additional constraint on the generation of internal funds for investment since interest payments represented the first call on funds. Later, government directives (notably the Coal Industry Acts, 1980, 1983) required the industry to break-even over a short time period. The NCB responded by proposing a reduction in capacity. The industry's room for manoeuvre was further reduced by the pricing policy imposed by the government. The price of NCB coal sold to the CEGB, which purchased 70 per cent of the industry's output, was cut partly as a prelude to the later privatisation of the electricity supply industry.

through the introduction of the Area Incentive Scheme (AIS) in 1977/78. Secondly, a programme of technical development was instituted, originally financed under the Plan For Coal.

At least three factors conspired to bring about the introduction of the AIS. Firstly, many pit managers believed that the NPLA, despite its emphasis on work study and increased supervision, had reduced incentives and was responsible for the productivity plateau of the 1970s (Edwards and Heery, 1989). The tripartite Coal Industry Examination of 1974, which was part of the PFC exercise argued that incentives were necessary to raise productivity (Hudson, 1989). Also, at the level of senior management there was a recognition that the NPLA had provided the basis for unity between areas which had been a factor in the 1972 and 1974 strikes (Feickert, 1986). Finally, pressure from the Labour government anxious to preserve its Social Contract, persuaded the NUM leadership to accept the AIS (Renouf, 1990). In fact, despite the idea of incentives being rejected at national NUM conferences and in a national ballot in the mid-1970s, the right-dominated NEC negotiated the AIS with the NCB and allowed individual areas which had achieved a majority for the scheme to negotiate separate area deals. The Nottinghamshire Area did so opening the floodgates for series of area agreements (see Renouf, 1990: 89-92). Arguably, the divisions resulting from the AIS contributed to those which underlay the 1984/5 strike.

Simultaneously, the NCB continued its programme of technical change. One element of this was the continued development of longwall

technology, but utilising heavy duty mining equipment (HDME). This programme began with the shield support programme in the late 1970s (see below). While these developments have been presented as a new departure in coal production, the director of the NCB's research and development establishment described them as 'consolidating the mechanization advances of the 1960s' (Tregelles, 1984: 401). The other main element was the application of advances in microelectronics to the production process. The Coal Industry Examination of 1974 argued that since 93 per cent of faces were mechanised the extra output from even modest increase in the average running time per shift would have a real impact on productivity and invested great hopes in remote control and automation (see Hudson, 1989: 179).

Attempts to automate the production process were attempted during the 1960s. A Remotely Operated Longwall Face (ROLF) was established at Bevercotes Colliery, but was abandoned because of the limited nature of electronic technology at that time (eg Burns et al, 1985). The wide availability of the transducer by the mid-1970s, however, prompted a new concern with automation, monitoring and control, which was centrally concerned with reducing machine downtimes (Tregelles, 1984, 1986) and which led to what is now known generically as advanced technology mining (ATM). The HDME/ATM strategy forms the basis of technical change in the subsequent period and is the subject of the following section[25].

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[25]For some senior members of management at least, these
(Footnote Continued)

5. TECHNICAL CHANGE IN THE COAL INDUSTRY IN THE 1980s

The process of technical change begun in the late 1970s comprised the application of HDME, the shift to retreat mining, the growing application of ATM and a range of supporting development all of which were addressed at eliminating the discontinuities in the powerloaded mining process. The main drift of these developments and the debates surrounding them are outlined below. In particular, in the light of the claims made for a generalised upskilling associated with microelectronics (see Chapter Two), the impact of technical change on skills is assessed. The discussion of skills, however, refers also to the specific debate on the nature of change in coalmining which emerged during the 1980s. The aim of the section, therefore, is to capture the qualitative significance of the technical changes of the period. The description of the changes goes into some detail in order to provide a basis of understanding for the case study material presented in the subsequent chapters.

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developments were seen as a complete package. In December 1973, Wilfrid Miron, a NCB member, outlined a secret strategy aimed at attacking the NUM, especially given the growing left-wing ('Communists, Marxists and the like') complexion of the NUM's executive and the growing number of 'Marxist indoctrinated' branch officials. Miron recommended the NCB should 'revert to some form of local pit or district incentives', a reconsideration of its relationship to the NACODS based on the recognition 'that they are less and less a part of management', an expansion of automation and the attempt to mine 'either without or with a minimum number of miners' and to ensure 'that of those employed in the mining industry the maximum number should be outwith the NUM'. While the actual impact of this thinking on the NCB is uncertain, there is little doubt it reflected the views of at least a section of management (see Bradshaw, 1985; Feickert, 1987).

Heavy duty mining

According to Wheeler:

> The concept of heavy duty mining was developed to enable British Coal to produce from less faces at a reduced cost. The approach is directed towards the coal face but can only be successful if the whole mine is geared up to handle the larger bulk tonnages and peak loads (1988: 17)

Essentially the term heavy duty is applied to powered supports, conveyors and powerloaders of a type larger, more powerful and more robust than is conventionally used, utilising very high levels of electrical horsepower. Central to the heavy duty face system is the powered shield support. The shield support face programme was introduced in 1977/78 when six faces were equipped with this technology (producing 2.1 per cent of total major longwall mined output). By 1987/88, 43 per cent of all major longwall faces were equipped with shield supports, representing over 50 per cent of deep mined output. Daily output per face (DOF) from shield support faces averaged 1496t compared to a DOF of 1003t from conventional faces. Output per manshift (OMS) is considerably higher on heavy duty faces than on conventional faces. In 1986 OMS from shield support faces was 31.88t compared to 17.82t from conventional faces (Moses, 1986; see table 4.3 and figure 4.2).

Heavy duty faces allow a greater volume of coal to be extracted at a greater intensity of production. One effect of the introduction of heavy duty faces has been to allow BC to concentrate production on a smaller number of faces while increasing levels of output. An important consequence of this is that a larger volume of output can be produced

with a lower level of manning. Producing faces at collieries fell by a third to 305 in the period March 1983 to April 1987 and then fell to 276 by the following April (BC, 1988), while output fell by less than 6million tonnes (mt).

As Wheeler points out, however, in principle the heavy duty concept is not confined to the face alone. Although heavy duty faces are the commonest expression of the trend toward this type of mining other aspects of the mining process are being given the heavy duty treatment. Mineral conveyors belts are being upgraded and free steered vehicles are being developed which can cope with heavy duty equipment. The heavy duty concept of increased strength and power should then be viewed as a context within which many of the changes outlined below are occurring.

Another important trend occurring alongside the introduction of heavy duty mining concepts is an increase in the average length of face. In the ten years up to 1982 the average length of face rose from 171m to 195m, an increase of 14 per cent. Longer face lengths have a number of advantages: a reduced amount of roadway formation per tonnesof coal produced; a reduced proportion of machine ancillary time per cutting cycle; a reduced capital investment for a given total face and reduced development effort per coal block and thus lower costs and higher levels of productivity (Horton, 1983)[26].

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[26]Related to these developments are attempts to achieve more
(Footnote Continued)

The trend toward retreat mining

Traditionally longwall faces have used advance mining methods. Under this system the extraction of coal is carried out (more or less) simultaneously with the driving of access roads (or gates). There are disadvantages associated with advance mining. One concern is that at the point where the face meets the gate an enormous amount of plant and machinery accumulates and can lead to congestion. This might lead to the disruption of the gate-heading process. In the area are conveyors for clearing coal, the gate-end box for the AFC, the hydraulic tank pump, the motor for the shield supports, electrical switchgear as well as gate headers. More importantly, the rate of extraction can be dependent, to a large degree, on the rate of formation of gate roads (Reid, 1945, includes a discussion of the relative merits of advance and retreat methods).

Since the mid 1970s the principles of retreat mining have been developed and the system has been widely introduced where geologically applicable. Such faces are seen to have advantages over advancing faces. Under the retreat mining system a panel of coal is extracted

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(Footnote Continued)
accurate alignment of the armoured face conveyor (AFC) with powered shield supports. This coordination is essential because of the large amounts of coal produced by high performance shearers. Failure to remove coal quickly from the face to outbye conveyors can lead to build-ups of coal at the face which can halt production. According to BC's Technical Director, Ken Moses, this lays the basis of the automation of the range of face activities and the possibility of the reduction in the size of face teams from an average ten workers to two (cited in Financial Times, 20.3.89).

using one or more gates which have been pre-driven to their ultimate boundary (from which extraction commences). Under this system because the gates have been pre-driven, the face ends, by definition are less congested and the rate of extraction at the face is independent of the gate heading rate. Moreover, by pre-driving the gates (in theory at least) an almost complete picture of the panel is obtained with early warning given about faulting and so on. These advantages have led to a rapid proliferation of retreat faces since the end of the 1970s. Where introduced retreat mining has led to significant productivity growth (see Chapters Five and Six). In most cases the shift to retreat mining has been made possible by the more widespread application of heavy duty heading machines.[27]

Developments "elsewhere below ground" (EBG)

Developments at the face are the most widely known of those occurring in the coal industry and, historically, face productivity has increased at a faster rate than the productivity of the mine as a whole, a trend identified by Reid (1945). The improvement of EBG productivity has now emerged as a priority for British Coal, but progress has been

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[27]Wider application of retreat mining has been made possible by the introduction of roofbolting. Roofbolts can be described as giant 'rawlplugs' which are inserted into overhead strata in order to support it. By 1987/88 31 per cent of all longwall faces were roofbolted prior to salvage (Daws, 1988). BC is keen to extend the use of roofbolting in the hope that it will speed up and cut the costs of development work (see Coal News, Oct 1987; Financial Times, 20.3.98). The NUM has regarded roofbolting as less satisfactory than girder support and general safety doubts have been addressed (TUSIU, 1988), but this does not appear to have slowed the introduction of roofbolting.

slow. The inability of BC to reduce levels of EBG manning reflects the higher levels of DOF which are associated with the face productivity gains since 1984/85. In fact in this regard BC appears to be running in order to standstill. Although there have been improvements in EBG productivity these have not been of the order of those occurring at the face.[28]

During the 1980s efforts were made to rationalise the back-bye infrastructure and to speed up and make more technically flexible the range of EBG activities. In some cases new arterial roadways were driven from shaft bottoms to workings in efforts to increase machine available time (MAT), improve materials handling capability and eliminate EBG jobs (e.g. Tucker, 1986; and Chapter Six). Elsewhere new manriding facilities were introduced, especially the introduction of battery powered locos to speed travelling times (see Chapter Five). More extensive use has been made of free-steered vehicles - an underground industrial tractor - used for 'load, haul, dump' (LHD) activites. By 1989 some 400 FSVs were in operation (Financial Times, 20.3.89).

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[28]Indeed the Monopolies and Mergers Commission (1989) report on the industry noted: 'Our recent report attached considerable importance to the control and reduction of EBG manning levels. We were therefore surprised to note that this had not become a feature of most capital investment projects we studied. In most cases this category of manpower as proportion of the total remained virtually unaffected. We note that BC has been making a continuing effort in this respect and that targets have been set and met. We accept that retreat working and other forms of modern mining technology at the face will (with lower face manning levels) initially lead to an increase in indirect labour (MMC, 1989: 9).

Further improvements to the back-bye infrastructure have included attempts to improve mineral transport. Delays in mineral transport through chute blockage or belt breakage occur largely because of an inconsistent size of mineral (the so-called 'large lumps'). Recently attempts have been made to combat this problem by the introduction of coal face sizers (or 'crushers'). Watt (1984) argues that mineral transfer has been characterised by a proliferation of short, low horse power conveyors with a high proportion of transfer points. He advocates longer length conveyors using heavy duty belts which reduces the potential for blockages and requires less labour.

Another means by which the productive flow of the mine is increased is through improved bunkerage. Bunkers are used to regulate the flow of run of mine coal (ROM) from the face out-bye, because coal can be produced at the face at a faster rate than it can be transported to the shaft bottom and beyond. Conventional bunkers, however, have proved unable to cope with the ever increasing levels of output achieved at the face. As a result high capacity horizontal strata bunkers have been developed. These are ingeniously simple and can be described almost as closed in roadways where coal can be stored without affecting face production.

Advanced technology mining

The process of automation has been outlined in influential work by the Bradford Group. The Group surveyed technical literature on MINOS (Mine Operating System) in the early 1980s (e.g. Burns et al, 1985;

Winterton, 1985) and concluded it was a modular concept comprising various subsystems. This facilitated central control and monitoring of underground activities from a surface control-room. The Bradford Group described the objectives of MINOS as threefold: to increase the productivity of labour; to increase the productivity of capital and to increase control over all aspects of operations. For instance, MIDAS shearer guidance is seen as eroding the autonomy of the shearer driver, while automated plant health monitoring (e.g. IMPACT) and the move from diagnosis and repair to the replacement of modules deskills craft-workers[29]. However, while the Bradford Group may identify an important tendency in restructuring, there is danger in overstating both the capacities of information technology and in seeing them as concerned with a deskilling imperative.

More recent engineering literature, for instance, tends to emphasise the limitations of existing automated techniques. Even where applied, automation and monitoring systems have been found to run up against

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[29]Penn (1990) criticises the Bradford Group for seeing automation as centrally concerned with deskilling and the increase in management control, especially in relation to craftwork. Penn's data does indicate growing supervision of craft-work and absence of systematic retraining of craft-workers, but his research in two pits in Lancashire in the mid-1980s found no evidence of self-diagnostic equipment. Also he argues while there was evidence of increased use of modular components in electrical equipment, this was not evidence of deskilling, because the electrician needs a broader understanding of the interaction of modules and their integration into the wider system. More broadly, the proportion of maintenance workers to production workers was growing in the pits in question. Penn, therefore, rejects the deskilling argument. In reply to these arguments Leman and Winterton (1991) make the reasonable point that the Bradford Group predictions on deskilling related to systems which were absent at the pits studied by Penn. This debate is illuminated in Chapters Five and Six.

clear operating limitations. For instance, face delay monitoring often has fallen short of establishing the true cause of such delays. A cited example is a display which indicates 'bunker full' - which is really an effect of some other action not a cause (Steel, 1988). The Bradford Group overestimated the extent to which automated systems were conceived as part of a totalising whole. MIDAS, for instance, is a stand alone system (Steel, 1988). Law et al suggest:

> There are at present a number of control and monitoring systems available for use at the coalface and others at various stages of development. These systems have been developed separately, leading to a situation where 'islands of automation' exist on the coalface, each improving the efficiency of operation it is applied to but working in isolation from others (1986: 126).

Also, the discussion of automation in the Bradford Group's approach tends to overlook other important non-IT changes such as HDME and retreat mining. Where these are discussed they tend to be seen as consequences of automation, when the logical causation is the opposite. In fact in most cases there is likely to be a complex interaction of IT and non-IT related technical change. The direction of present technical change, it would seem is accurately captured by Gibbon and Bromley who argue:

> The existing critical literature on technical change in British mining perhaps inadvertently gives the impression that the main change in the last decade has been the introduction of microelectronics and that the impetus behind this change has been to deskill the workforce and concentrate management control of the labour process. There is little doubt that microelectronics do indeed centralize management control over information and deskill workers (especially fitters and electricians). But microelectronics in combination with heavy duty technology is mainly intended to minimise downtime and hence increase unit output. Some elements of technical change (eg. FSVs) have a higher skill content for operatives than the technology they have replaced. Future technological change lies in the extension of heavy duty mining methods supported by microelectronics rather than the universal

application of microelectronics (1990: 67; cf. Hopper et al, 1985)[30].

The possibilities for increased management control nevertheless are exemplified by FIDO (Face Information Digested On-line) system. FIDO monitors the activity of the shearer, gathering information which is transmitted to the surface control room. It seeks to identify delays in the coal getting process and to allow management to act upon these. Also, it helps management to identify long term trends in delays and allows the planning of corrective action. A feature of FIDO is the facility for increased managerial control:

> The system improves communications. The controller knows immediately the face is stopped; he does not have to rely on a message from underground. Using the status display, and his own knowledge and experience, he can often interpret what is happening on the face. When he contacts the face his questions are straight to the point. People underground are aware of the resources which are available to the controller. They realize that he will not be fobbed off with imprecise information, hence their replies to his questions are more accurate (Cleary, 1981: 288).

In theory, the miner's ability to determine the pace of his work is significantly eroded. Part of the purpose of FIDO it seems is the elimination of natural breaks by powerloaders, which are regarded as a source of 'avoidable' delays. In addition, two former Derbyshire miners have described how FIDO interacts closely with the operation of the

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[30]According to Tregelles (1986) IT-related research covered five areas: improvement of plant design criteria; condition based maintenance of plant; system monitoring for operational management (initial concern was with ventilation following industrial action by deputies, but was later extended to monitoring the running time of conveyors and face equipment); automation (especially of conveyors and coal prep plants, but later of shearers); and management information systems.

bonus scheme to increase the pressure to keep machines running and to maintain output (Bohen and Wroughton, 1988: 103-104)[31].

BC made extensive use during this period of advances in microelectronics, particularly transducers. The incorporation of transducers into plant was used in some cases to give real-time condition information. Machine condition monitoring systems (e.g. IMPACT) predict breakdowns by noting temperature rises or excessive vibrations and, therefore, eliminate some regular inspection tests. Repairs can be planned outside production time. Information stored on computer enables accurate records of performance by items of plant to be produced and influences maintenance plans and future design modifications (Bates, 1981; Horton, 1983). Such systems help to increase machine running time and, in theory, reduce the demand for craft labour.

One current preoccupation in BC is with the automation of coal conveyancing. There are two reasons behind this:

> There is need to optimise the load to match coal flow from powerloaded faces. There is also need to reduce the number of men operating conveyors by using remote control. Advances in electronic data transmission, sensors, transducers and computers have been exploited to meet these demands (Tucker, 1986: 382).

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[31]Reporting research conducted in the period prior to the miners' strike, however, Hopper et al (1985) found little evidence that such technology was perceived as a threat and concluded that management's complete mastery of technology and workforce remained elusive. Instead their account emphasised the importance of an increasingly rigorous financial environment and the pressures this placed on individual pits in providing the impetus to restructuring (see section six below).

One means by which BC intends to achieve this is through the the automation of coal conveyancing, through MINOS, which is now present at 90 per cent of mines[32]. According to Tucker high levels of manning EBG often reflect 'lack of properly designed, remotely controlled conveyor transfer points' (1986: 382). Tucker states that 1986 Area figures showed a range of 36 per cent to 86 per cent of transfer points were manually operated. BC believe that automation of coal clearance and conveying could substantially improve productivity and reduce EBG costs. There is also a belief that increased automation of conveyors outbye can lead to a reduction in delays and belt stoppages. Tucker suggests that collieries equipped with automated coal clearance, where introduced, have led to the elimination of the equivalent of 1.14 jobs per plant item controlled, with delays being 20 per cent less than with manual operations. MINOS systems have also been developed to monitor environmental conditions, such as dust and methane build-up. This aspect of MINOS has been linked by senior BC figures with the desire to reduce the number of safety officials (deputies) underground (eg. Northard, 1987)

The extent to which centralised monitoring has been successful in its central aim of reducing downtime is difficult to say. It appears that machine running time increased from 24 per cent of the average shift in 1983 (Cox, 1987) to 34 per cent in 1987/88 (Steel, 1988). Logically,

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[32]Steel (1988) lists the aims of MINOS as a) the receipt of environmental information with limited control and storage; b) remote operation of plant; c) monitoring the running of plant and providing production information on downtime.

MINOS must have played some part in this, but there are other considerations (see below). In the post strike period, however, MRT has appeared to remain at around 110 minutes. Even now machines are said to be operating at less than 50 per cent of (theoretical) potential (Steel 1988). BC, despite its best efforts, appears to be having little success in increasing MRT as a proportion of MAT:

> Statistics show that there has been no improvement in machine running time in the past four years: on average the machine cuts coal only two hours out of five hours of available time per shift. The increase in output per day and productivity is explained by the fact that heavy duty faces in medium to thick seams have a production capacity of approaching 1,000t/h therefore producing more tonnes per minute with no additional running time (Hartley, 1990: 223; see Figure 4.3).

Present developments focus on attempts made to integrate the information gained from various monitoring and control devices through EASY (Event Analysis System) and the CIS-VAX system[33].

Attempts to improve machine reliability

The concentration of production on fewer faces made possible by the introduction of HDME has increased the importance of efficient maintenance procedures, in order to minimise machine downtime. This is

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[33]EASY is a software package for analysing data produced by monitoring systems. Data from MINOS, FIDO and so on are inputted and output consists of histograms, graphs, charts, etc. CIS-VAX develops the principles of previous management information systems. Its development was stimulated by slow progress in raising MRT despite widespread automation and plant monitoring. It represents a step forward in the attempt to capture real-time information and to integrate the analysis of data from various systems (Steel, 1988). It is testimony to the argument which I raised earlier about the limited nature of much automation and monitoring.

achieved partly through automated condition monitoring. These systems also have the aim of reducing the need for craft labour. Such systems are complemented by a range of less dramatic but equally important developments in preventative maintenance.[34]

Since 1984 BC has been introducing routine condition monitoring (RCM) in order to provide the technical information required for constructive maintenance schedules:

> Routine condition monitoring is the application of test equipment on either a routine or continuous basis to monitor the performance and condition of machinery against Acceptance Standards (Cutts and Entwistle, 1988: 278).

Acceptance standards are established during commissioning tests. This allows machines to operate at optimum performance and also provides 'trends' in machine deterioration for the purpose of scheduling constructive maintenance outside production time. The equipment used in RCM is often relatively simple. Endoprobes (or borescopes) are used as optical aids to visual non-destructive examination of inaccessible plant. These operate on the same principle as endoscopy in surgery.

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[34]Until recently a colliery's maintenance requirements were administered through the planned preventative maintenance (PPM) system. PPM encompasses a variety of work schedules ranging from simple visual examinations to internal inspection of machinery and also includes the time-based or cyclic changes of plant. This approach is reliant on the judgement of craft-workers carrying out the examinations in order to plan remedial work. During the periods between the examinations, there is little indication of impending breakdowns which can lead to lost production. Moreover, PPM does not check the performance and condition of machinery and this results in a situation where it is not performing at its optimum. Also, according to management: 'This type of maintenance is expensive in manpower, since the physical examinations can be lengthy and mostly have to be implemented whilst machinery is standing during non-production periods or alternatively at weekends (Cutts and Entwistle, 1988: 278).

Similarly, oil debris analysis can be carried out with an instrument costing as little as £2,000. Oil debris testing can be used to assess gearbox or pump performances and to measure levels of contamination in order to predict breakdowns. Here oil samples are taken on a regular basis from gearboxes and then processed through the debris tester to provide an indication of the amount of metallic debris present in the oil. By logging the results graphically a trend can be observed as to the rate of deterioration and hence a judgement can be made of when a gearbox is likely to fail (see Jarvis and Lewis, 1984).[35]

This pattern of technical change is almost fifteen years old and has tended to proceed incrementally and, before 1984/5, appeared to have a limited impact on productivity. Given that most of the changes outlined above have been underway since the mid 1970s it seems surprising that it is only in the period since 1984/5 that significant gains in productivity have been registered. Plotted on a graph it might be expected that the productivity curve should show a steady increase through the 1980s. Instead Figure 4.1 shows the early 1980s were characterised by a plateau followed by a rapid rise after 1984-85. If the strike period represented an interruption in the slow process of

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[35]In addition the information generated by RCM is leading BC to tighten the specifications for equipment which it gives to suppliers in an effort to 'design out as much maintenance as is practical' (Greaves and Thompson, 1986: 333: see also Northard, 1986). One aim of RCM is that all information generated can be computerised and subject to analysis in the constant search for 'trends'.

technical change, the question is: what changes occurred in the post-strike period to cause a rapid rise in productivity?[36]

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[36]This is not the place to offer an account of the strike (for which see Adeney and Lloyd, 1985; Beynon 1985; Callinicos and Simon, 1985; Renouf, 1990), except to make the following points. First, the governments planned confrontation with the miners (see Beynon, 1985) can be seen (to use Elger's phrase) as a 'distinctive moment' in restructuring of the 1980s and the assertion of the government's definition of the industrial problem as one of labour intransigence. Norman Tebbit described it as the 'the last battle' in the attempt to break the 'shackles' of trade unionism in Britain (Schwarz, 1985: 52). State ownership played an important part in determining that the dispute would be concerned with subordinating the role of labour, providing a powerful 'demonstration effect'. This presumably was the meaning attached to Nigel Lawson's phrase that the strike was 'a worthwhile investment' (Adeney and Lloyd, 1985: 202). Secondly, the conduct of the strike had a number of implications for the post-strike pattern of restructuring. On the union side, a number of factors contributed to a debilitating weakness. In some parts of the country, large numbers of miners had responded to the NCB's back to work campaign and returned to work and the emergence of the strike breaking UDM severely weakened the position of the NUM. Also, the NUM itself returned to work without a settlement which put the union in a weak bargaining position (in the words of one of my NUM informants: 'the only union in the country which doesn't recognise the management'). On the management side, the strike led to the eclipse of management moderates and the rise to power of a militant faction of management under the patronage of Ian MacGregor. For instance, immediately after the strike key management moderates like Geoffrey Kirk (public relations) and Ned Smith (personnel) left the NCB. MacGregor later said of Smith who opposed the back to work campaign: 'I saw the need to hold the line to establish the right to manage as paramount: he thought the need to compromise was paramount' (MacGregor, 1986: 290). For MacGregor, Smith was representative of the failed management of the past: 'his naturally establishment mind had been developed in a culture [of nationalisation] trained to avoid aggression' (ibid: 186). It was during and shortly after the strike that management hardliners such John Northard and Ken Moses, former Area directors who had prosecuted the strike with particular vigour, were appointed to national positions (see Winterton and Winterton, 1989: chapter seven). Locally also personnel changes were important (see Chapter Six below).

6 RESTRUCTURING LABOUR RELATIONS IN THE POST STRIKE PERIOD

The most dramatic consequences of the miners' strike were the resulting capacity closures and job losses. In the period 1983/4 to 1989/90, the number of collieries fell from 170 to 73 and the workforce from 192,000 to 65,000. During the same period output per manshift rose from 2.43t to 4.32t. However, all analyses of the post-strike restructuring stress the limited impact of closures in productivity improvement and the more important effects of changes in surviving pits (Glyn, 1988; Prior and McCloskey, 1988; Richardson and Wood, 1989)[37]. If the progress of technical change over the 1980s has been incremental and slow, the pace of restructuring in labour relations in the post-strike period has been rapid and dramatic. These changes reflected the determination of BC, in the words of Ian MacGregor to 'reassert management's right to manage' (MacGregor, 1986).

In the period prior to the miners' strike there was disquiet within the coal industry and beyond that the process of technical change in the industry since the late 1970s had failed to halt escalating costs of production and had not led to the expected productivity breakthrough (eg. Spanton, 1982). For instance, in their 1983 report on the

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[37]Glyn, analysing the immediate post-strike operating results, argued: 'Less than one sixth of the productivity increase after the strike reflected the direct effect of closing low productivity pits (the 'cricket team' effect). Similar portions were accounted for by the reallocation of manpower to more productive pits and by increasing the number of shifts. This left a full half of the the productivity rise accounted for by increasing output per manshift within the collieries which stayed open' (1990: 172).

industry the Monopolies and Mergers Commission focused the fact that despite extensive mechanisation of the industry labour costs still accounted for nearly 48 per cent of operating costs (MMC, 1983: 14). As Gibbon and Bromley (1990) put it, for the MMC (and others) the structure and practices of the labour force were out of synchronisation with the available technology[38].

The defeat of the miners' strike, therefore, presented an opportunity to bring work practices into line with the new technology. The process of restructuring, though, was determined by more immediate pressures deriving from changes in market relations.[39] In the immediate

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[38]The Monopolies and Mergers Commission focused particularly on the size of the craft labour force which amounted to 20 per cent of men on books (MOB) in 1981 despite the growing application of self-diagnostic equipment. Also noted was a general surplus of workers and low levels of productivity EBG and a general decline in machine running times in the period 1979/82. In this regard they proposed shift reforms and improvements in shaft to face journey times (MMC, 1983; also Gibbon and Bromley, 1990).

[39]The financial constraints within which BC operates were tightened because of the threat to its markets from imported coal. The role of the state in exposing BC to these 'market forces' was important. Between 1982/6 there was a 33 per cent increase in internationally traded coal, but lower oil prices, the failure of Japanese imports to grow as anticipated in the late-1970s, and increase in nuclear power production (especially in Western Europe) and the prevalence of long-term contracts substantially reduced prices. Also, a number of major coal facilities, mainly in the form of low-cost surface mines, whose rationale was an expected rise in prices and demand, were about to come on stream . The British electricity industry, encouraged by the Tory government, was committed to reducing costs in the run-up to privatisation. The CEGB (purchaser of 70 per cent of domestic coal output) and NCB had signed a 'joint understanding' in 1979 (amended in 1982, 1983, and 1986 to reflect the growing market weakness of BC). The 1986 agreement covered the period to mid-1991 and was negotiated against the background of CEGB claims to be able to import 30mt of coal in 3-5 years. The CEGB agreed to take BC output but only when BC agreed to sell a portion of it at

(Footnote Continued)

post-strike period key management figures outlined a strategy for addressing these problems, a codified expression of which was the Wheeler Plan which outlined conditions for producing coal from 'a typical midlands colliery' while reducing costs from £1.44/gigajoule (gj) to £1.11/gj (Wheeler, 1986).[40] Wheeler argued for alteration to shaft operations to make production and conveying of coal underground more consistent and less prone to peaks and troughs. He argues that more consistent production and increased output could be achieved by abandoning the Five Day Week Agreement and allowing coaling to take place over six days per week using three extended shifts per day. This would allow coal to be produced continuously and for the shaft to be operated for 23 hours per day.

(Footnote Continued)
prices equivalent to those on the international spot market. This increased the financial pressures on BC (see Taylor, 1990, for a concise discussion of market changes and the role of the state in promulgating them).

[40]BC was conscious of the growing influence exerted by the international coal trade on the domestic market. This trade is inherently unstable and BC attempted to build recognition of this instability into its restructuring. The foundations of this restructuring were set out in the 'New Strategy for Coal (1985) which replaced the PFC. The Strategy argued that slow productivity growth, rising costs and falling demand required a shift from output planning to a selling-based approach. The guiding criteria would no longer be output, but production costs per gigajoule (a metric measure of heat value). The Strategy assumed any colliery not producing at or below £1.65/gj (later reduced to £1.50/gj) would not be economic in the long-term (Taylor, 1990). Hopper et al (1985) noted that under the nationalisation regime individual pits were largely insulated from financial pressures because marketing and pricing functions were assigned to area or national level. The cost per gigajoule formula, I would argue, can be seen a formal mechanism for transmitting competitive pressures down the organisational hierarchy (see Chapters Five and Six).

Wheeler also proposed savings in manpower in all aspects of the mine - by contracting out surface activities and by concentrating production on fewer faces. Savings in craft labour are suggested by merging existing fitters and electricians jobs into a single electro-mechanic and by redistributing some maintenance tasks to machine operators. He also proposes an end to the traditional separation between the safety and production responsibilities of deputies and overman. Northard, another key figure in senior management takes this further and argues that improved environmental and plant monitoring by remote control: 'provides the opportunity to reappraise supervisory and organizational requirements' (1987: 111).

Wheeler suggests that innovative forms of payment can help to improve productivity. For example, he notes that development and salvage work are subject to peaks and troughs and are notoriously difficult to plan, but suggests that: 'tasks such as building large machines can be achieved in hours rather than days and that junctions can be erected in days rather than weeks (Wheeler, 1986: 158). This appears to be a reference to the use of ad hoc contracts paid to individual miners or groups of miners for the completion of particular salvage or development tasks outside of normal working hours. Wheeler sees such devices as only one in a range of local or area based incentive schemes which he envisages.

Northard sums up the philosophy behind all of these moves:

> Output can be increased without adding to investment by utilising the installed capacity more intensively (1987: 112)[41].

These proposals have become known as the 'Wheeler Plan' and have been described as representing in their entirety 'classical flexibility' when the strategy as a whole was endorsed by BC chairman Robert Haslam (The Guardian, 27.11.86).[42]

Following the return to work there is evidence that BC attempted a formal introduction of the Wheeler plan. In the immediate post strike period, BC proposed a series of changes to mines safety legislation as part of its pursuit of the Wheeler proposals. BC ended the 'de facto' closed shop of NACODS - the supervisors' and safety officials' union - in retaliation for a series of damaging strikes. BC proposed amendments to the Mines and Quarries Act, 1954, to allow pit managers

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[41]In fact from the early 1980s senior managers stressed that they did not envisage any fundamental technical advances, but rather the wider application of proven technologies (Spanton, 1982; Horton, 1983).

[42]Agreement to six day coal production has been achieved in certain circumstances. Miners at Cynheidre in South Wales agreed to six day coal production in order to overcome geological problems (Guardian, 20.7.88), but this did not same the pit from closure. Miners at Solsgirth colliery in Scotland agreed to six day coaling in order to reduce costs in an effort to ward off closure threatened by the South of Scotland Electricity Board's decision to import cheap foreign coal (Financial Times, 23.2.86). Also six day working forms the core of the agreement between the UDM and BC for the operation of Asfordby mine and was the source of dispute between the NUM and the South Wales Area officials over the proposed development of Margam mine. Prior and McCloskey conclude: 'It is likely that, aware of its implications for increased output, six day working will not be pressed for in the immediate future except as a negotiating ploy for some specific projects such as Asfordby, Margam and Frances. But the proposals remain as markers for the pattern of development and they will, inevitable, become the price paid by miners for any new investment in particular pits' (1986: 29; see Chapters Five and Six below).

to do the work of deputies as long as there are an adequate number of miners with first aid certificates (Financial Times, 4.2.88). Northard (1987) stated that there is no reason why all safety tasks should be the responsibility of a single official, implying that safety tasks could be devolved to a range of workers. BC called on the government to remove the legal constraints stopping miners from working underground for more than seven and a half hours at a time, as is required by the 1908 Coal Mines Regulation Act. This was been linked specifically to the need to introduce longer shifts at undersea collieries in the North East because of long travelling times (Financial Times, 30.11.88).

In general, however, the trend to 'flexible working' has been less complete and more uneven. Press reports suggest new work practices are being widely introduced. According to one report:

> British Coal is achieving a variety of new working practices in pits, but does not want to identify the extent of the development because of opposition from the National Union of Mineworkers (Financial Times, 14.7.88).

In some pits it is reported that men are replacing the previous shifts at the coal face rather than at the shaft bottom, increasing MAT by up to an hour. Subcontracting is said to be much increased. In addition the use of ad hoc contracts for development and salvage work is reported to be widespread (eg Financial Times, 1.7.88, 14.10.88; Evans, 1988). Gibbon and Bromley (1990) note employee costs fell as a proportion of operating costs from 52 per cent (1985/6) to 42 per cent (1988/9). General attempts to reform the shift system led to an increase in the 'shifting index' from 215.5 per man per annum in 1981/2 to 241.5 in 1988/9 (Gibbon and Bromley, 1990). Also, important changes have been made to the operation of incentive schemes (see below). The changes

have been significant, although regular reports in the Financial Times made it clear that the rate of change appears highly uneven across areas and between pits.

The significance of the changes have led some writers to suggest that the post-strike productivity rises and costs reductions can be attributed to these developments. Prior and McCloskey examined the reduction in the costs of production achieved by BC in the post strike period. In particular, they analysed the 13 per cent drop in costs which BC achieved between 1985/6 and 1986/7. According to this analysis, cost changes did not show any significant correlation with obvious parameters such as pit size, productivity or amount of investment in the pit. They suggest that output increases achieved with a reduced workforce account for a greater proportion of cost reduction (and productivity gain) than does technical change. They argue on the basis of a detailed analysis of colliery statistics that the average operational pit shed 14.2 per cent of its workforce between February 1986 and July 1987. They conclude:

> ...about 50 per cent of the drop in British Coal costs has come not from colliery closures nor from new investment but from a generalised shakeout of labour...Almost certainly it is a process which had been carried on from the first days back after the strike when part of the old workforce simply failed to pitch up and the management imposed new practices much as the Crusaders imposed Christianity on the heathen and heretic. Undoubtedly some labour reductions were the consequence of new technology at the coal-face or elsewhere. But there is little evidence that they stemmed from any particular breakthrough. Rather they derived from the

> sudden application of [work] practices which had been available for years (1988: 43).[43]

Richardson and Wood's (1989) analysis of the post-strike change in South Yorkshire suggested that the most important factor in explaining the rapid rise in productivity was the replacement of the Yorkshire Incentive Scheme (negotiated under the provisions of the AIS) by the Doncaster Option. In the latter performance standards are said to be more favourable to management, there is less room for negotiation over delays and the payment system is more fractured between different work groups. According to Richardson and Wood the new system is seen as contributing to more continuous production. Together with a wider attack on job controls and custom and practice and the general tightening of labour discipline (e.g. enforcement of good time-keeping) this has allowed pits to achieve commercial targets.[44] Productivity rises are offsetting wage increases allowing miners to make high wages. The 'historic' productivity improvement of the post-strike period, however, is a product of management 'taking advantage of a unique opportunity' (p46), arising from the defeat of the NUM, but is

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[43]Glyn's analysis of BC's operating results in the immediate post-strike period leads him to argue that 'current investment can have played little role in the post-strike period; almost all the productivity growth must have reflected pressure on miners to raise output in the surviving pits, together with reductions of manpower' (1988: 171).

[44]It is from Richardson and Wood that Metcalf (1988) takes the anecdote about 'water notes'.

consistent with a 'fundamental change in workers attitudes', reflecting a less collective outlook.[45]

All of these studies contain insights, but remain partial accounts, not least because of the limited time frame within which they analyse events. The assumption that restructuring can be equated with post-strike events is erroneous. The approach of Prior and McCloskey and that of Richardson and Wood stresses the absence of technical change and therefore assumes that more 'flexible' work practices and new bonus schemes can account for the rapid rise in productivity. However, changes in labour relations in the post-strike period have acted upon, as described earlier, a longer established trajectory of technical change. In some ways the post-strike restructuring must address the extent to which BC introduced work practices which were co-terminous with the existing pattern of technical change. To this extent it is something of a false dichotomy to separate technical change and changes in work practices (cf. Chapter Two). The post-strike period was characterised by a complex interplay of technical and labour-related changes which varied inter-regionally as shown in the following two chapters.

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[45]Edwards and Heery (1989) attribute a leading role to the bonus reforms in the productivity improvement of the 1980s. Their study, however, is essentially a study of the introduction of the AIS in the mid-1970s. Their attempt to update their findings in the light of post-strike events is based on interviews with industrial relations staff at BC's London headquarters. In my view this weakens their understanding of post-strike changes which are highly varied at the regional and intra-regional level (cf. Chapters Five and Six).

Richardson and Wood's idea that somehow or other the acceptance of revisions to payment systems in the post-strike period is consistent with fundamental attitude changes on the part of miners needs to be challenged. It is necessary to place the acceptance of such schemes into the context of wider developments in management/union relations. It is possible to identify two parallel processes in post-strike industrial relations. Following the defeat of the strike, especially under the MacGregor regime, it is apparent that there was an attempt to destroy the NUM and to see its replacement by the strikebreaking UDM. Management made a series of unilateral and provocative alterations to agreements and procedures, notably through the introduction of a draconian disciplinary code. Simultaneously, the NUM itself has abrogated its national negotiating role. Gibbon and Bromley (1990) note that, under MacGregor, local managers were encouraged to press home the advantage against local NUM branches, exemplified in the notorious statement: 'people are now discovering the price of insubordination and boy are we going to make it stick' (quoted in Tomaney and Winterton, 1990: 24).

Under MacGregor's successor, Robert Haslam, a certain subtle shift in attitude can be detected. The stalemate between BC and the NUM has continued at the national level. However, local managers, aware that a policy of confrontation alone is insufficient, began to promote the existence of 'common interests'. This approach provided certain attractions to branch officials who were under pressure due to the failure of the NUM leadership nationally to agree a strategy on closures and wages. This implies the necessity of local accommodations between

managements and unions in the effort stave off closures and secure movement on the wages front. In short local branches have engaged in a process of 'bargained retreat' and acceptance of certain arguments about competitivity. In the process local branches have made concessions on working practices and payment systems. Rather than being expressions of a new individualism, the changes charted by Richardson and Wood are better understood as an expression of the emergence of 'market corporatism' built on an altered balance of power (Gibbon and Bromley, 1990; cf. Terry, 1989).

7. CONCLUSION

This chapter has been concerned with describing the general tendencies inscribed in the programme of technical change and the restructuring of work practices while attempting to retain a sensitivity to the possibility of a diversity of actual outcomes. The strategy of technical change arising from the provisions of the PFC was based around heavy duty mining equipment, but this technology could only be applied in thicker seam conditions. For instance, between 1982/88, 75 per cent of BC's £3,700m investment programme was concentrated in just four regions - North Yorkshire, Nottinghamshire, Central, South Yorkshire - whilst a mere 15 per cent was allocated to the North East, Scotland and South Wales (MMC, 1989). Thus, one would expect to find an uneven distribution of new technology. Most analyses of the post-strike restructuring have tended to be of events at the industry level or have abstracted from single local cases to make pronouncements about national developments. Yet the pattern of change has been highly

uneven. This leads Glyn to argue that the 'whole pattern of regional variation really deserves thorough analysis based on a detailed study of the evolving industrial relations situation in the different areas' (1990: 172). This stands as further testimony to one of the central propositions of this thesis - namely that broad patterns of change are mediated by complex and equivocal pattern of local variation.

The following case studies of the North East and Selby coalfields are a contribution to that process. They make an interesting contrast. Very little of the investment arising from PFC went the way of the North East (see Hudson 1989: chapter seven). Similarly the average seam sections of the North East prevented the comprehensive application of the HDME/ATM strategy. Paradoxically, although the level of productivity remained comparatively low the rate of increase in the region has been among the most rapid. Furthermore, by 1989/90 the North East produced the lowest cost output within British Coal and was described as 'the jewel in British Coal's crown'. The North East is a particularly interesting case because it has been characterised historically by a regionally distinctive set of job controls.

In contrast, Selby is an entirely new mine (or mine complex). Its development was a central proposition of the PFC and from the outset was designed to embody the latest advances in mining equipment and in information technology. Accordingly, Selby might be seen as a 'post-Fordist' coalmine and as such is a good place to examine this contentious concept. This task might seem paradoxical. Why 'test' for advanced production methods and new forms of work organisation in an

'old', extractive industry like coal? Kern and Schumann, for instance, suggest that in such industries as shipbuilding, the steel industry and mining, firm strategies are simply a matter of 'naked economic survival':

> In these crisis centres there is little room for the idea of new production concepts: their fight for survival is characterized by the destruction of capacity and declining significance in the economic hierarchy (1984: 165).

However, the case of Selby suggests that this generalisation is only partly true. Capacity closure was an important feature of restructuring in the coal industry during the 1980s, but in Britain this occurred alongside the creation of entirely new capacity, which incorporated a production process which embodied the latest form of microelectronic technology. Chapter Five examines the North East and Chapter Six examines the Selby case. Some contrasts are drawn in Chapter Seven.

TABLE 4.1

Percentage of Output Powerloaded, 1946-1967

1946	2.0
1947	2.6
1948	3.7
1949	4.4
1950	3.8
1951	4.1
1952	5.2
1953	6.1
1954	7.9
1955	10.8
1956	15.5
1957	23.0
1958	27.8
1959	31.3
1960	37.5
1961	47.7
1962	58.8
1963/4	68.4
1964/5	75.0
1965/6	80.7
1966/7	85.7

Source: NCB Report and Accounts, cited in Kelly (1969).

TABLE 4.2

Non-Mechanical Delays in Coal Production, September 1977

ACTIVITY	MINUTES
Late-start Winding Relay	.91
Late-start Man rider Relay	1.05
Late-start-Excess travel/Prep	11.30
Late-start-after Snap	.97
Early finish	3.30
Wait at Shaft side (Shift End)	.85
Total	18.38

Source: Production and Productivity Bulletin, September 1977; cited in Fine and Harris (1986:192).

TABLE 4.3

Impact of Heavy Duty Equipment

Equipment	December 1988 Daily output per face (t)	No of Faces
Conventional only	1177	74
One HD element:		
Shield support	1369	61
Shearer	1126	31
AFC	1451	2
Two HD elements:		
Shield support & Shearer	1399	29
Shield support & AFC	2106	11
Shearer & AFC	2077	9
Three HD elements:	2445	32

Source: Moses (1989)

TABLE 4.4

BRITISH COAL

Costs of Production (£/gj) 1985/9

1985	3.68
1986	1.78
1987	1.60
1988	1.63
1989	1.54

Source: NCB/British Coal, Report and Accounts, 1985/6-89/90.

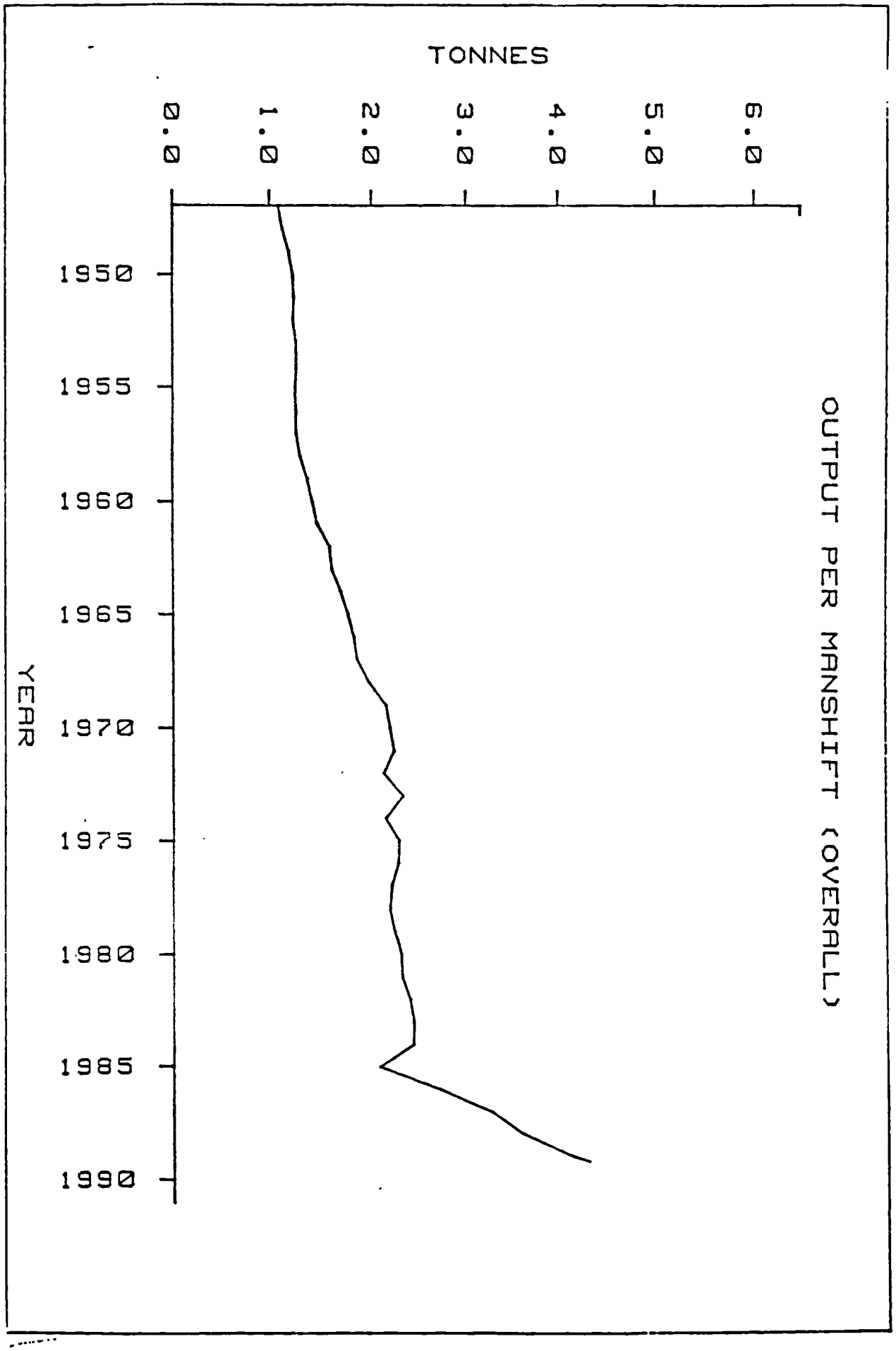
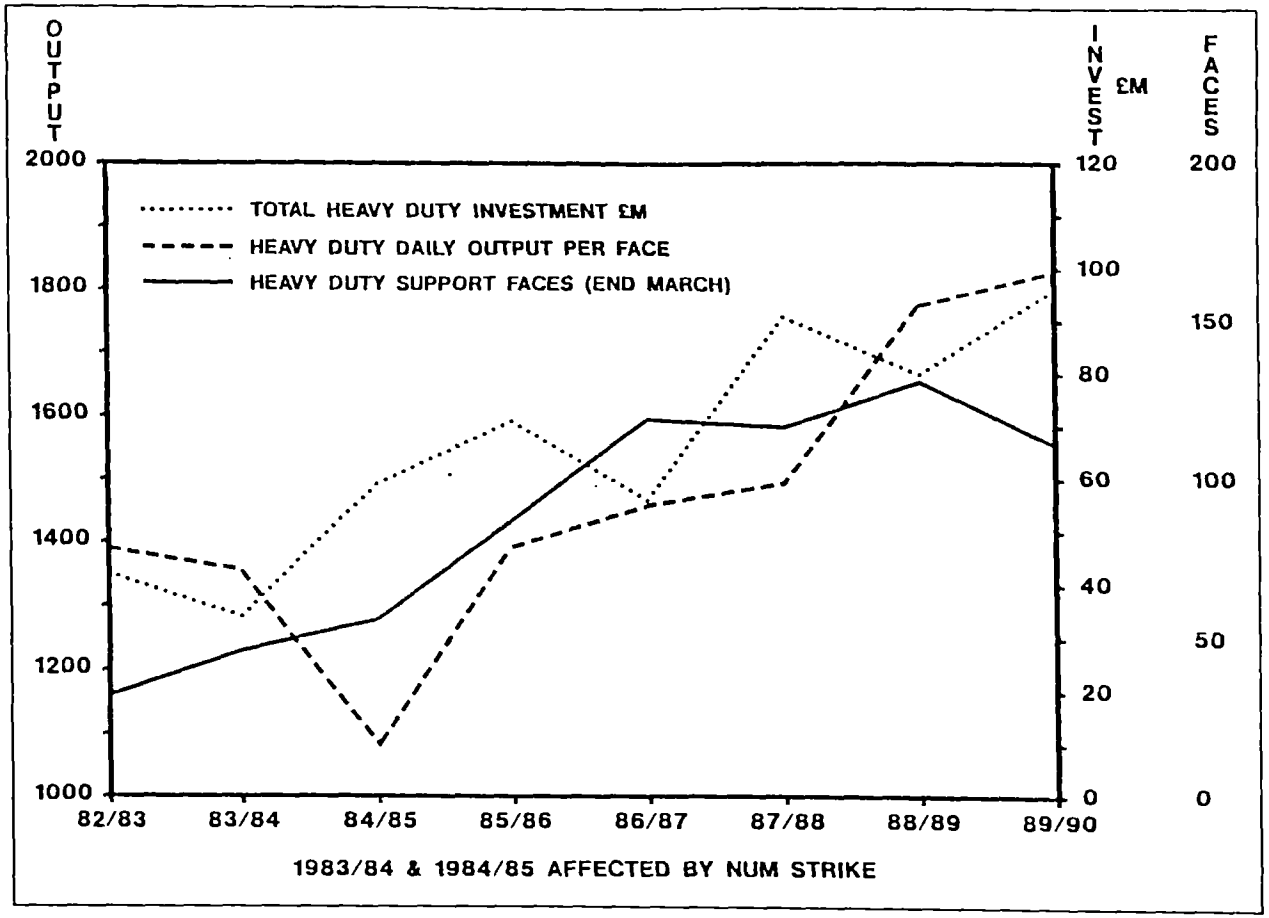


Figure 4.1
Post-war productivity in mining

Figure 4.2

Heavy duty investment and results

Table 1 Heavy duty investment and results

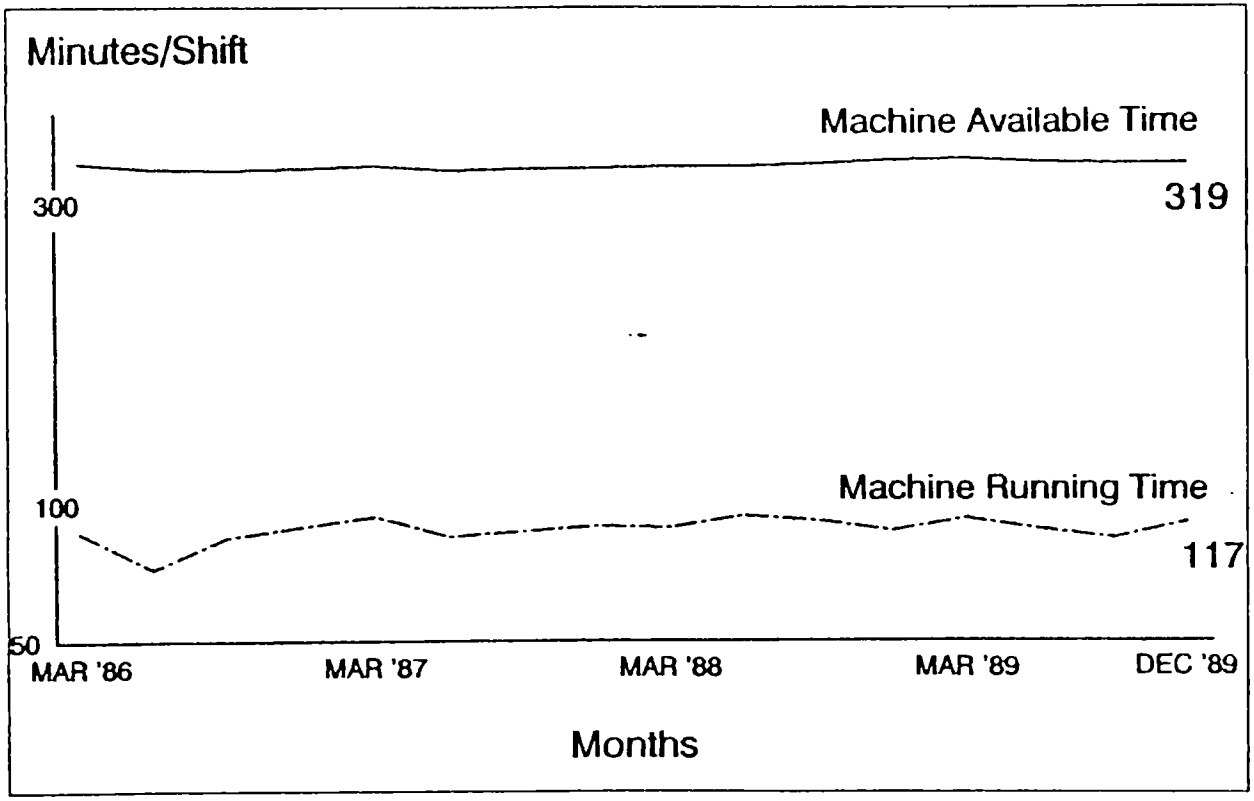


Source: Brabbins (1991:296)

Figure 4.3

BRITISH COAL

Machine available time trends



Source: Hartley (1990:223)

CHAPTER FIVE

THE NORTH EAST: 'THE JEWEL IN BRITISH COAL'S CROWN'?

1. INTRODUCTION

This chapter focuses on the process of workplace restructuring in the North East coalfield during the 1980s. The chapter charts the rapid rise in productivity in the coalfield in the post-strike period. While throughout the 20th century the coalfield has undergone more or less progressive decline, by 1989/90 British Coal's North East Group recorded a £66m profit, the highest of any group in the country. At the same time production costs fell to £1.40/gj, the lowest in the country. In fact this was the best financial performance the coalfield had registered since nationalisation. Moreover, during 1989/90, according to British Coal, not a single tonne of coal was lost due to industrial disputes, a testimony to a change of attitude on the part of its employees. These developments led BC's then chairman Lord Haslam to describe the North East Group as 'the jewel in British Coal's crown' (British Coal, North East Group, press release, 30.8.90).

The aim of the chapter is to examine the basis for, and the character of this productivity improvement in the light of the discussions in previous chapters. The dramatic rise in productivity in the North East coalfield has been offered as evidence of the wider 'productivity miracle' and industrial transformation of the 1980s. On a visit to the North

East in September 1990, the then Tory Party chairman Kenneth Baker cited increased productivity at British Coal as evidence of the wider transformation of the region's industrial base (The Journal, Newcastle, 21.9.90; also Tomaney, 1989). The character of the transformation might then be said to evidence something about the nature of this miracle. In what sense, then, has a productivity 'miracle' occurred in the North East coalfield? What part has technical change played in the productivity increase? Have new work practices played a part? If so, how have workers faired in the process of change?

The argument advanced in this chapter is that the productivity improvement which occurred in the period after the strike in the North East has been based on fragile and limited foundations; an argument advanced with regularity by officials of the NUM in the region and at individual pits during the course of the fieldwork on which this chapter is based. It is also argued that there was disquiet about the emerging mining practice among at least some managers.

The chapter begins by briefly outlining the historical development of the coalfield. There are two ways in which the history of the coalfield influenced the pattern of contemporary developments. Firstly, the North East coalfield has been an important location for the type of highly developed job controls alluded to in the previous chapter. These are outlined in more detail. It is shown how such union operated job controls survived mechanisation and continued to exist up to the miners' strike. Post-strike restructuring in the North East was partly concerned with eliminating these 'restrictive practices'. Secondly, the

pattern of technical change and capacity restructuring under nationalisation had implications for mining practice in the North East. In particular, the chapter demonstrates how the peculiar features of undersea mining were important in determining the pattern of post-strike restructuring. Finally, the development of the North East's market situation is outlined in order to highlight the relative vulnerability of the coalfield to competition.

Subsequent sections outline the nature of technical change in the region - taking the long view deemed appropriate in the previous chapter - and the post-strike restructuring of work practices. Data and discussion on regional trends in production indicators is provided, but in order to capture processes as well as trends, this is supplemented by data from more in-depth and qualitative case studies of change at two pits carried out in 1989/90. The discussion on changes in work practices is drawn principally from these studies. Further details on the rationale for this choice of pits is provided in Appendix One. The aim of these locally based studies is to highlight both the character of the new working practices, their relationship to technical change and the uneven and contested nature of their application. The conclusion reached is that significant changes in work practices occurred in the period from the end of the strike. The basis for this reorganisation was the profound defeat inflicted on the NUM in 1984/5 which weakened the union and made it impossible to resist management's imposition of new working practices. Furthermore, faced with real closure threats and inactivity from the national leadership, even the most militant union

branches (Lodges) increasingly offered concessions to management in the pursuit of an often elusive 'viability' for their pit.

2. THE DEVELOPMENT OF THE NORTH EAST COALFIELD

The historical legacy and the nature of mining in the North East

The Great Northern Coalfield (encompassing Northumberland and Durham) is the oldest coalfield in the world and mining has taken place there since Roman times, but expanded rapidly during the nineteenth century[1]. Since nationalisation in 1947, however, the North East coalfield has undergone a process of decline. In 1946, the last year before nationalisation, the region produced 34mt. In 1947 there were 188 mines in North East England employing 149,000 men. By 1983/4 these figures were 16 and 23,000 respectively and output was just under 11mt.

In short, nationalisation allowed the managed decline of the North East coalfield (Hudson, 1989; Renouf, 1990). While it is frequently argued that such decline is the outcome of immutable geological factors (ie. the exhaustion of seams), in the case of the North East, the process of technical change was also important (cf. Chapter Four). Coal mining in the North East began at the outcrop (in the west of the region) using bord and pillar methods to exploit thin seams. The mechanisation

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[1]Peak output was achieved in 1911 when 56mt was produced.

process around longwall faces described in the previous chapter led to the progressive demise of bord and pillar mining as production was concentrated on thicker seams suitable for powerloading technology. Together with the decline in markets for coal after 1957 this had two consequences for the North East. Nationally, production became concentrated in the central English coalfields where the seams were suited to mechanisation. This process helped to underpin the massive closure programme of the 1960s which transformed the North East economy. Regionally the same process of producing coal mechanically from thicker seams led to the gradual concentration of production in the east of the region.

The concentration of production in the East of the region had an important implication for current mining practice. It meant that increasingly mining occurred under the North Sea at ever increasing distances from the shaft bottom. This, in turn, has meant that mining in the North East is subject to peculiar production constraints rarely encountered elsewhere. Production units are up to 7 miles from the shaft bottom and the question of their further extension is determined both by thickness and quality of reserves and upon production results offsetting the adverse effect that increasing distance has upon operating costs, in the light of intensifying market pressures. In particular British Coal suggest that operating costs will be increased by the maintenance of bigger and longer roadways; the provision of additional roadways for ventilation; the provision of facilities for high speed manriding to maintain face available time; the extension of conveyor and other service systems including power transmission;

increased power consumption for transport, ventilation and pumping; depreciation on additional equipment and the provision of additional waste disposal facilities. Of these factors, the problems with ventilation and the need for a viable working time at the face are seen as the most likely restricting factors (Archibald, 1988).

Job controls and industrial relations in the North East

The industrial relations traditions of the North East coalfield have developed over two centuries. Under private ownership, following the formation of stable unions in the late 19th century, labour relations were characterised mainly by paternalism on the part of the owners and moderation on the part of the official trade union movement. This latter moderation was exemplified in the acceptance of the sliding scale by the Durham Miners Association and the Northumberland Miners Association (Austrin and Beynon, 1981; Douglass, 1977). However, during this whole period, moderation at the level of the regional union bureaucracy was complemented by traditions of rank and file militancy in many areas - notably around Tyneside (Douglass, 1977) and in parts of North West Durham (Turnbull, n.d.).

This militancy, according to David Douglass, a working miner, had roots in the traditions of job control unique to the region. According to Douglass: 'The cavilling system is the chief instrument of job control in the Durham coalfield' (1977: 229). Cavilling has its origins in the organisation of a fair distribution of bord and pillar work under conditions of private ownership:

> Cavilling was the simplest, most democratic form of job distribution which the workers could possibly have developed for the purpose, given the conditions of private enterprise. It was a way of equalizing chances and sharing out opportunities. Because of geological conditions there are some good places in a pit, some bad and more dangerous than others. A face of coal may be hard and close cleated; the roof may be soft or the stratum sodden with water. All of these things interfere with the miner's capacity to earn wages. Without the quarterly cavils one team of men might be stuck with foul conditions where the work was harder but the money less, because the stratum made production difficult. To even things out the cavils provided everyone with a swap (Douglass, 1977: 229-30)[2].

Cavilling had an additional advantage:

> The cavilling system was a first line of defence against victimization. If the management had picked the places, union men and agitators would have stood little chance against the favourites (Douglass, 1977: 231).

Cavilling was the basis for a tradition of more extensive spot bargaining over piece rates in the Northern coalfield. While this was translated into traditions of militancy in the cases of pits like Wardley and Chopwell ('Little Moscow'), the traditions of cavilling and extensive spot bargaining of tasks and rates were common throughout Durham and Northumberland and were carried over to the powerloading era and reformulated to meet the demands of mechanised mining (Douglass, 1977: 215; Kreiger, 1983: 157-170; see below).

The cavilling system was symbiotically related to the traditional marra relationship. In bord and pillar mining the full range of mining tasks

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[2]'Cavilling was in stark contrast to the southern 'butty' system of sub-contracting, in which men literally fought each other for places, and the maxim was 'every man for himself'' (Douglass, 1977: 231; also Krieger, 1983; Waller, 1985).

were completed by pairs of colliers who, whether together during a given shift or on different shifts, shared the same paynote. Miners united in this way were marras[3]. Marra groups were self selecting and typically made up of men of a comparable standard of work performance. The introduction of longwall mining led to a broadening of numbers and definition, with as many as two or three dozen men on each of three shifts, but the principles of self-selection and composite tasks remained:

> Most important, the marra group took on new importance in the day-to day development of the power relations which emerged between management and men. The marra group became the unit around which opposition to management initiative naturally coalesced...Long after the bord and pillar system which generated it had receded into marginal existence...the marra relationship continued to condition the laboring relations and the power relations of Durham miners. It generates rules for worker self-selection of work team and assignment of task, and cooperative regulation of output. It has fundamentally conditioned the political culture of the underground life (Kreiger, 1983: 86-87; also Douglass, 1977: 221-229).

Both Krieger and Douglass make clear that the cavilling and marra traditions survived the transition to powerloading and continued to form the basis for a solidaristic workplace culture.

These traditions coexisted with political moderation at the regional level. Prior to the strike of 1984/5, however, changes in the political outlook of the miners' unions at the regional level began to occur, particularly in Durham. Lloyd notes that during this period: 'In the North East, a

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[3]The term since entered the wider dialect in the North East to take on a more general meaning of 'friend'.

young, radical leadership had taken power at pit level and was pushing the previously centrist leadership to unfamiliarly militant postures' (1985: 22)[4]. This formed part of the background to the vigorous prosecution of the strike and also the subsequent restructuring in the North East.

Plan for Coal and the North East

The provisions of the Plan for Coal which underpinned the NCB's investment strategy in the 1970s (see chapter four) had a specific effect on the North East. The planned expansion of capacity envisaged in the PFC was intended to come from the central English coalfields. Consequently, the bulk of the investment associated with the PFC was to occur there (eg. the development of the Selby complex, see Chapter Six). In the North East only one relatively large investment - relative that is to the scale of investment in the 1960s rather than to that in the central coalfields after 1974 - was planned to increase coking coal production from the Horden-Blackhall-Easington complex for British Steel Corporation's Redcar complex. BSC's decision, as a consequence

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[4]In fact the process of political change had begun earlier. The signs of change were indicated by the Durham miners' support for strike action in 1981 over the closure issue. In 1984, following the death of Tommy Bartles, the leader of the Durham Mechanics and a leading figure in the right nationally, Bill Etherington, the left's candidate was elected as President. After the strike the left's control of the union was consolidated with the election of David Hopper and David Guy as General Secretary and President of the Durham Miner's Association. The Durham Miner's Association and Durham Colliery Mechanics Association together with their equivalents in Northumberland merged in 1988 to form a single North East Area of the NUM. A fuller account of the process of political change in the DMA and DCMA is provided by Renouf (1990).

of government pressure after 1979 to cut losses, to import cheap coking coal led to the closure of the pits in the period before and immediately after the strike (Hudson, 1989: chapter 7; Beynon et al, 1990).

In the period after the approval of the PFC the pace of decline in the North East coal industry moderated. Between 1974/5 and 1979/80 the number of collieries fell from 35 to 29, with employment falling from 38,000 to 33,000 over the same period. Output during this period fell only marginally from 14.6mt to 14.1mt. Of significance though was a fall in OMS from 1.89t to 1.87t. The decline in OMS during the late 1970s is indicative of the relative lack of investment in the North East coalfield under PFC. Thereafter OMS improved if slowly to reach 2.23t by 1983/4, a consequence, according to Hudson (1989: 190) of cuts in capacity, reductions in employment and reorganisation of work practices in remaining pits rather than investment in new technology. Despite the increase, OMS remained at less than a third of the target level specified for new collieries in the central coalfield.

One consequence of the progressive loss of coking coal markets was to increase the reliance of the North East on the CEGB for the purchase of its output. In the post-war period the new Thameside power stations had become an important market for North East coal[5]. By the mid 1980s, North East output was highly dependent on these markets.

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[5]For instance, the reconstruction of St Hilda pit in South Shields into Westoe colliery was with the purpose of supplying the Thameside power stations.

However, given the desire of the electricity supply industry to import increased amounts of coal, these markets were highly vulnerable due to the ease by which they could supplied by sea from the Amsterdam-Rotterdam-Antwerp spot market[6]. For these reasons the post strike pressures for restructuring, if anything, were more acute in the North East than elsewhere, while the basis for producing coal competitively seemed absent.

3. EXPLAINING THE PRODUCTIVITY IMPROVEMENT

Between the end of the strike and 1989/90 productivity almost doubled to 4.09 tonnes per manshift. In 1984/85 there were 15 operating collieries employing 18,000 men. By 1989/90 the number of operating collieries had fallen to 7 employing less than 11,000 men. In 1985 the then NCB began measuring deep-mine production costs in terms of price per gigajoule (£/gj) and at that point, nationally, was producing coal at £3.68/gj. (There was no complete regional breakdown of production costs on this basis at that time). By 1989/90 the now British Coal's costs of production had fallen to £1.54/gj with costs in the North East amongst the lowest in the country at £1.43/gj (Tables 5.1; 5.2).

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[6]Chapter Four charted the growing emphasis on financial performance at colliery level during the 1980s, particularly after the publication of the 'New Strategy for Coal' in 1985. Tight cost parameters were introduced against which all new investment projects and the viability of individual collieries would be assessed. Costs per tonne were replaced by costs per gigajoule. Among other things, this amounted to a signalled that BC saw its markets in terms of power stations (where the measure of heat value was crucial) and an abandonment of a serious concern with markets for coking and anthracite grades - the traditional specialities of the peripheral coalfields (cf. Hudson and Sadler, 1990).

Table 5.1 shows the closure of eleven collieries during the 1980s and the concentration of production on just 29 faces (compared to 61 in 1982/3), together with the loss of 50 per cent of the workforce. Despite this, saleable output fell by only 17 per cent, a state of affairs explained by a 87 per cent increase in productivity which incorporated a 73 per cent increase in daily face output (D.O.F.). Figure 5.1 illustrates the growth in daily output per face and suggests that as far as the 1980s are concerned, it is essentially a post-strike phenomenon. This change is a function of several factors. The fact that productivity changes are more than the arithmetical effect of pit closures is evidenced by an examination of changes in remaining collieries. Table 5.2 gives production indicators from Westoe Colliery and shows that the colliery actually increased output with a steadily declining workforce between 1983/4 and 1989/90. The processes which have underpinned this change are the subject of the rest of this chapter. The discussion is separated into a section on capacity and technical factors and one on changes in work and industrial relations.

4. PRODUCTIVITY IMPROVEMENT: A TECHNICAL ACHIEVEMENT?

In an effort to disentangle the determinants of change, this section examines the contribution of technical change and the restructuring of capacity to the improvement in productivity and face output. On the one hand it might be presumed that productivity improvement in the North East simply reflects the broad process of technical change, based on heavy duty technology and advanced microelectronics, outlined in the previous chapter. On the other hand, it should be born in mind

that the investment contained in the PFC was destined for the central coalfield rather than regions like the North East. Also, despite the productivity improvement achieved in the North East the national productivity rate of 4.14t was still some 32 per cent higher. The discussion below recognises that some technical change has occurred, but stresses the relatively limited nature of change.

Changes in mining equipment and mining practice

One significant change during the 1980s was the relative growth in retreat mining. Figure 5.2 shows that saleable output from retreat faces rose from less than 30 per cent at the beginning of the 1980s to over 60 per cent in 1988/9. The technical advantages of retreat mining, described in the previous chapter are reflected in the relative performance indicators. In the North East area the D.O.F. of advancing faces in 1988/89 was 1,150t and the figure for retreat faces was 1,414t. In addition, retreat faces in general operate with much lower levels of manpower than do advance faces which mean that they have higher OMS[7]. However, it is also important to recognise that while retreat faces tend to outperform advance faces the performance of the latter improved in the 1980s. Between 1982/3 and 1988/9 D.O.F. from

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[7]For instance at Westoe an advance face might operate with 17 men while a retreat face will operate with as few as 10 men. This difference reflects the technical advantages of retreat mining, that is, the pre-driven gateways obviate the need for development workers and ancillary workers in the face-ends. A commonly expressed analogy is that with retreat mining 'all your troubles are left behind you'. A reduced workforce and higher output translates into considerably improved productivity.

advance faces rose from 647t to 1,159t suggesting wider factors were at work[8]. Certain limits to the application of retreat mining are discussed below.

Figure 5.3 shows a growth in average total length of face in the period after the strike. However, it is likely that this rapid growth is partly the arithmetical effect of the post-strike closures of smaller collieries. In surviving pits, however, increases in face length have occurred throughout the 1980s. For instance, at Westoe face length has increased from an average of 230m in the early 1980s to about 270m in 1989, but again this reflects in part the abandonment of smaller faces. Such changes, therefore, are likely to account for only a small part of improved D.O.F. and cannot account for the rapid rise in D.O.F. after 1986.

Figure 5.4 shows shearer results for the period 1978/79 and 1987/88. Over this period the average square metres cut per machine shift was

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[8]Despite the improvement in advance face performance, the drawbacks of this method seem the same as they have always been, that is, an inability to keep the gates advanced (I return to why this might be so later). Some innovative methods have been attempted to overcome this problem. For instance, at Wearmouth Colliery, attempts are being made to advance the headings up to 80m in front of the face line in order, as it were, to disengage the gate formation process from the actual coal getting process. However, some of the classical problems of advance faces remain, notably, transporting materials into the headings. Also, at some pits the partial retreat system is used where two advance faces are worked but are separated by a panel of coal which is then retreated using the existing gate roadways from the exhausted faces. This system helps to reduce development costs, although it does not have all the advantages of full retreat.

doubled. Particularly noticeable is the rapid increase in the post-strike period. This might be taken to reflect a drive to heavy duty mining. However, the progress in the direction is more limited than the data suggests. There is evidence that in the post-strike period there has been a wider application of proven conventional technologies. An example is the wide use of the Eickhoff shearer which is, it is argued, particularly suitable to the prevailing thin seam conditions in the North East because it is two thirds the size of a standard shearer. But these machines were already used in many collieries prior to the strike and do not meet a common definition of heavy duty equipment. It seems unlikely, therefore, that they account for more than part of the performance improvement since then.

Strictly defined there are no heavy duty faces in the North East. For instance, the average cost of a face at Wearmouth in 1989/90 was £1.5m compared to the cited cost of heavy duty face of between £6-10m (see Chapter Six). Items of heavy duty technology were introduced on only a small number of faces, notably F seam at Westoe and at Ellington and Easington. For instance, on F35r at Westoe, a heavy duty, all-electric shearer is used. These faces, while not fully heavy duty (ie they don't have heavy duty chocks), did see very high performance levels. Westoe's F36 and F35r faces topped the area face league for September 1989. F35r achieved an average output of 2867t per week at an O.M.S. of 68.4t. This is compared with national output and productivity averages for the same period of 1666t per week and 43.33t respectively (see Coal News November 1989). However, the gap between the best performing faces and the rest remained considerable. Out of 19

retreaters in the North East area only 5 performed better than the national average (see Table 5.4). According to managers the thinness of seam sections in North East pits remains an obstacle to the application of HDME on a wide scale. Heavy duty technology was designed for faces in excess of 5m in thickness and where sections are narrower than that investment in HDME cannot be justified economically.

Significant moves were made in the post-strike period to restructure capacity through the concentration of production, particularly in areas of good geological conditions. In part this is reflected in the abandonment of attempts to mine in very thin seams - after 1987/88 seams of less than 90cm were no longer worked. This seems to reflect a 'more commercial' attitude to geological questions on the part of BC managers than was previously the case. A long serving member of management at one pit described how in the past winning coal in faulted ground was seen as a test of a manager's engineering expertise and was regarded as a challenge. Nowadays, he argued, commercial pressures tend to preclude this. It seems also that at least some managers in the past inculcated an ethos of the nationalised industry which placed an obligation on them to extract coal wherever possible and to avoid sterilisation of reserves. This attitude seems less common today. This process of focusing production on the best reserves can be seen as part of a wider process of concentrating production in time and space in response to heightened commercial pressures to reduce unit costs. The important point, though, is that one effect of concentrating production in these areas is to allow face equipment to perform better.

Indicators of shearer performance do not take into account the effect of geology.

However, where existing, the combination of good geology, heavy duty machines and retreat mining, together with careful planning of face organisation represents a potent recipe for high performance. Where introduced, heavy duty equipment has tended to be concentrated on retreat faces which allow the extraction rates which repay the associated high investment in quick time[9]. However, retreat mining has limited application for geological reasons. For instance, the fivequarter (F) seam, the main producing seam at Westoe, is overlain by heavily water bearing strata while itself being sloped. In this district a system of one advance face and one retreat face is operated off the lateral roadways so that the water runs into the goaf rather than onto the face.

Faster rates of face extraction necessitate faster development rates. The technical backwardness of the North East in the early 1980s is

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[9]An NUM official reflected on how these factors come together on the high producing faces at Westoe, mentioned earlier and how they contrasted with previous methods: 'In the past, you see, they used to use longwall advance. They didn't use retreat faces a lot, so that on a longwall advance you'd maybe have two machines and they would only be single-end. Only very occasionally double-end. So the mothergate machine would come up and cut so far, but the tailgate machine would come down and put what you call an end on for that machine to come up and take it off. You might be waiting at the face ends because you had to build butts and things like that, you might be waiting for the caunch. Or you might be waiting of the advance heading. There were all sorts of things involved...(Now) what happens is it's a retreating wall. You drive two gates, drive them in a 1000m, drive a face across that and just pull it back out. With one double-ended, Eickhoff machine...'

revealed by the fact that, as late as 1985/86, headings were advanced at some pits through the shot and handfill method. All headings in the region are now mechanised. While this might be seen as a technical breakthrough, in effect it is simply a catching up exercise. Headings were advanced by roadheaders, with 'heavy duty' models such as HD and LH 1300 and 1500s used in some pits by the late 1980s, notably Westoe and Ellington. The improvement in rates of advance is shown in Figure 5.5, which seems less dramatic than for other indicators and which is discussed in more detail below.

In Chapter Four it was noted that the inspiration behind advanced technology mining (ATM) was a concern to reduce machine downtimes. Qualitative evidence suggests that a reduction in many categories of face delay occurred after the strike, although comprehensive quantification is unobtainable. More robust and reliable shearers mean that machines on the face tend to run for a higher proportion of the shift. This is particularly the case on retreat faces, where face stoppages are less common. Moreover there is evidence that routine condition monitoring may have had some success in reducing in-production breakdowns[10]. Face delays are less common than hitherto, but interview evidence suggests that the main delays do not occur at the face but in the outbye coal clearance system, a point developed further below.

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[10]This development is discussed in more detail below.

The concentration of production in discrete zones and on fewer faces is the most marked feature of the post-strike restructuring for better productivity. At Westoe, for instance, there has been a long term reduction in the number of faces from six to four. Of these four faces, two faces produce the bulk of the output, the two other faces making a somewhat more marginal contribution. The two high producing faces are concentrated in one district - the fivequarter (or F) seam. Whereas previously faces were distributed throughout the pit production now occurs in more closely defined geographical areas. Currently, major drivages are underway to develop an area known as the 'Sea Winnings', lying below the old Whitburn Colliery take. This area holds 22mt of proven reserves in high seams. It is intended to operate this district on the basis of retreat faces with pre-driven gates of 2,000m.

A similar process of concentration occurred at Wearmouth where the number of faces were reduced from seven faces to four. Subsequent developments at Wearmouth were designed to concentrate production in one district, the 1570 level (and to close another district, the 1850). This remaining district will be on the same level as proven, but as yet undeveloped reserves of 100mt, in 92inch seams. Management stated their intention to concentrate production in this area (see Figure 5.6) on the basis of one or two faces (see Harrison, 1989).

The process of concentration has not been smooth and experience at Westoe and Wearmouth suggests the fragility of the strategy. At Westoe, the introduction of a prototype all-electric Eickhoff shearer on to a well performing face in 1988 was designed to raise output but

almost proved disastrous for the pit. Following its introduction the machine suffered from severe mechanical problems. This soon translated into production losses on F33s and the escalation of production costs. A similar scenario was played out at Wearmouth with the loss of J39s due to geological problems. In both cases management responded to the crisis situation by making demands for coaling outside of normal production hours. In the case of Westoe they were largely successful in instituting coaling in the 'dead period' between the afternoon and night shifts. At Wearmouth, attempts to produce coal on a weekend resulted in a walk-out and the first sustained industrial in the the North East action against this practice (discussed in more detail below).

The main problem arising from this strategy is that the fewer the faces the greater the consequences if output is lost. NUM representatives have stressed the dangers of this strategy, but disquiet extends to sections of management. As a senior management figure at a colliery moving toward single face production put it:

> This concentration in time and space may be good from a business point of view and it may be a policy which should be pursued. But I think we've over-pursued it...Operating only one face places pressure on everybody: the management, the maintenance people, the engineers, the people who have to work it. It means that there is intense pressure on all aspects of operating a single face. That sort of pressure over long periods takes its toll.

Whereas in the past when pits were operated with more faces lost output from one face could be made up from increased production from elsewhere, the reduction in the number of faces makes this increasingly difficult. One purpose of the face reductions though is to concentrate

management's minds on the elimination of stoppages and delays. The same manager noted:

> The people at the top tend to look at the potential of the expensive gear that we use. And what they say is you're not using the equipment to its greatest potential. And the pressure to improve performance on your best faces isn't great enough, so we'll take away some of your insurance and that will focus your mind on that which you've got left. That's the approach.

Higher tonnages produced at the face put enormous pressure on the coal clearance system: it is here that the cause of most stoppages occur. In part problems of belt stoppages are overcome by the use of bunkers which help to regulate the peak flows of coal off the face. At Westoe this includes a 1000t semi-automated horizontal strata bunker in addition to conventional staple bunkers. The bunker, a relatively simple and cost effective system, provides a regulated output of 1,200t/h onto the outgoing trunk conveyor irrespective of the tonnages conveyed from the faces (see Mine & Quarry, May 1988).

At Westoe, moreover, attempts have been made to integrate the coal clearance system to a hitherto unprecedented degree through the installation of a rapid loading system at the pithead (Colliery Guardian, March, 1988; Watson, 1990). The purpose of the system is to ensure a constant flow of mineral out of the pit by facilitating the easier loading of railway waggons for prompt despatch of trains to the Tyne coal terminal at Jarrow, where the coal is loaded onto colliers. This integration has caused problems of its own as one informant described:

> We've upgraded all the conveyor belts in the colliery - upgraded to wider width belts. We've got the three thousand tonne staple...[But]...once you've filled every thing up underground there's nowhere else to go. It's a bit of a false economy to store it, you've got to get rid of it at the end of

> the day. Yes we do have a problem. There is a problem at the moment getting the coal away at the staithes, or, the train can't take it to the staithes. Therefore, the coal can't be loaded onto the train. This goes all the way down the line. One derailment - if British Rail comes of the tracks - it keeps the coal down. We end up having to store a full days coal production underground. Once you've done that it takes quite a long time to filter it away during the rest of the week.

The limited and undramatic nature of technical change is further illustrated by a discussion of the application of the microelectronic-based technologies.

Automation, remote control and monitoring

In Chapter Four it was shown that automation and remote control were an important part of the NCB's strategy in the late 1970s and early 1980s. Investment in new technology did not occur on a large scale in the North East though. While in the central coalfields the expansion in capacity was intended to embody the latest advances in the technology, the implications of the process technical change for peripheral coalfields like the North East at best were ambiguous. In the work of the Bradford Group on automation and remote control (discussed in Chapter Four) it was suggested that systems such as MINOS were likely to be concentrated in the central coalfields. Moreover, the rise in productivity inevitably arising from the introduction of such systems would increase the productivity gap between the central coalfield and the peripheral coalfield. Indeed the Bradford group suggest that it is

the introduction of new technology leading to a rise in productivity which underpinned the closure programme of the 1980s[11].

Limited forms of automation and remote control were present in all pits in the North East by 1989 and systems such as FIDO had been in existence prior to the strike. Automation and control systems were used in several ways. Firstly, through MINOS, automation of routine tasks such as belt minding, transfer point attendance, pump and ventilation minding had begun. District belt systems were operated from a console located at a remote point. The main arterial belts tended to be controlled from the surface. In some cases belts have relatively few transfer points and are anything up to 1km in length. If belts do stop for any reason this is monitored by MINOS which gives information on location and duration of the stoppage. Also remote monitoring of environmental conditions exists at some pits. At Wearmouth, for instance, the highly advanced system which is used to control the recirculation of air and thus to ensure adequate ventilation in seams many kilometres from the shaft, is almost entirely automated (Robinson and Harrison, 1987)[12]. It is clear that the most advanced forms of automation such as auto-steering and in-built condition testing of shearers had not been introduced, and because of their apparent

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[11]The case of the North East, however, would tend to emphasise also the importance of market factors in determining the pace and character of restructuring (see section two above and chapter four below).

[12]At present such systems are used in conjunction with the regular inspections and manual tests carried out by deputies although British Coal have intimated that such systems indicate that modern collieries can operate with fewer numbers of safety officials (Northard, 1987).

inappropriateness for North East conditions they are unlikely to be introduced[13]. Despite these developments, however, there is little evidence that substantial inroads have been made in reducing the proportion of EBG workers in line with BC's stated intentions. Figure 5.7 shows data from Dawdon colliery suggesting that while absolute numbers fell proportions remained fairly similar.

In addition to automation ATM has been used in two other clearly discernible reasons. Firstly it has been used to help in the analysis of delays in the coal getting process. According to managers the principal advantage of sensor-based monitoring systems such as MINOS and FIDO derives from the information generated about production stoppages. However, the most sophisticated real-time delay analysis systems such as CIS-VAX are not used, but earlier systems such EASY are used in at least some pits in the North East. The information produced via MINOS and FIDO, is analysed only in unusual circumstances (such as in the field trials of new equipment). Although managers gave examples of how information generated by MINOS and FIDO had been used to 'design out delays', the limited nature of monitoring systems in North

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[13]One exception to this generalisation was the introduction of remotely controlled shearer operation on K41s at Ellington (Coal News, September, 1988). More generally, a branch official, from a colliery with thin and heavily faulted seams, pointed to a possible paradox in relation to highly automated methods such as auto-steering arguing: 'Auto-steering only works where it isn't needed - where you've got big level seams and where only an idiot couldn't cut a good horizon. It's no good in the North East where you have bad geological conditions'. It is possible that such technologies may be more appropriate if exploitation of the Sea Winnings at Westoe or the thick coal at Wearmouth become a reality, as these will utilise HDME. There is a more detailed discussion of auto-steering in the next chapter.

East pits should be stressed. Monitoring systems had rarely progressed beyond a simple STOP/START recording facility. Delay analysis relied heavily on manual inputting of data into computers from control room and craftsmen's reports and was therefore used sparingly[14]. Also, some important activities were not subject to monitoring, notably heading work. Here work rates tend to be governed by old fashioned supervision from the overman (cf. Chapter Six).

Whether such systems have made a significant contribution to raising productivity is ambiguous. One branch official of NACODS speculated that the inclusion of sensors on belt systems and so on, actually contributed to delays by making them more sensitive to misalignments and so on and causing them to stop in ways which would not have happened in the past. Testing such a hypothesis is very difficult, but it does receive some support from the comments of deputies at other pits concerning environmental monitoring systems such as the AJ Jones system, which is described as 'unreliable', often giving rise to warning signals for no apparent reason.

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[14]Management stressed that because - with EASY - data is manually inputted, using the system is time consuming and labour intensive. Therefore the system has tended to be used sparingly (eg during the field trials of new equipment). Also, in some cases, data was considered suspect because it came from a variety of sources including crafts-men's reports, rather than being recorded directly using transducer technology. There were no plans to introduce the more advanced real time system CIS-VAX.

The second way in which ATM systems are used is for very obvious supervision reasons. Among faceworkers, development workers, craft-workers and back-bye workers alike there is universal agreement that systems such as FIDO and monitoring devices in general have significantly assisted management attempts to raise pressure to overcome production stoppages. The comments of a branch official at one case study pit are revealing:

> We've got examples at the pit. The other week...[we]...were in the pit just clearing up under the belts, just messing about really. We went along to a box end and we found the box end covered in filings and coal. So we stopped the belts and cleared it all out and made sure it was safe. Within two minutes of it being stopped they [the surface control] were on the phone asking what was the matter. When we told them where we were, there was panic. They sent the overman out! He said: 'Ah well, there's usually a man here and all the rest of it, it's not usually like this'. But it had obviously been like that for days. They didn't put any pressure on us two, but if it had just been one of the normal lads, a buttin' lad, sitting quiet doing his job, there'd have been hell on because the belts were stopped. Because it was...[us]...who'd stopped it they didn't say owt, because it wasn't worth any hassle to them. But that kind of thing happens all the time - 'What's the belt standing for? Get it away!'. That sort of thing. The pressure's on them continually to get production going...

It is in this rather crude way that microelectronic-based monitoring systems were used in North East pits.

Conversations with miners and craftsmen reveal that there is a general puzzlement at the limited extent to which ATM systems have been introduced into North East deep-mines. Many miners (and indeed deputies) report a period of enthusiasm for systems like FIDO a few years ago but that this appeared quickly to wane. Others express surprise that their worst fears of constant supervision and deskilling of facework through microelectronics have not materialised. It is unclear

why this might be so. One plausible explanation is that BC engineers do not see these systems as justified or appropriate in the North East case. This could be argued on engineering grounds or on the basis that impressive productivity increases can be achieved without recourse to this kind of investment.

Taking all this evidence together I would suggest that the main significance of ATM has been through the automation of routine tasks, allowing a limited integration of the production process via delay analysis allowing a certain reduction in 'the porosity of the working day'. However, it cannot be used to explain the raising of effort levels, because FIDO, etc., existed prior to the strike in many pits. While automation and, remote control and monitoring do provide management with certain 'control' advantages there are strict limits on the effectiveness of such systems. Moreover, there is little sense in which management conceive such systems as 'modular' or part of an integrated whole. One of the principal problems is the lack of compatibility between different systems. Also control over automated plant is not always centralised, but exercised from district consoles. Monitoring is centrally concerned with machine downtime and smoothing the production flow (although the latter is still subject to delays) rather than control of the workforce, although the latter may be facilitated by some technologies. The productivity improvement cannot be attributed to any technical breakthrough in the North East. Instead, limited, incremental improvements were identified.

Automation and skills

The controversy concerning the impact of technical change on skills, particularly that based on microelectronics - outlined in the previous chapter - is partially illuminated by the experience of change in the North East. As far as debates concerning the coal industry are concerned the Bradford Group, it will be recalled, argued that systems such as MINOS deskilled work while Penn argued that moves to modular technologies merely change the nature of maintenance skills.

Taking production workers first, there is little direct evidence that the work of facemen or development workers is being 'deskilled'. Few production workers identify directly any change in the skill content of the main tasks. Moreover, systems such as auto-steering, identified by the Bradford Group as potentially deskilling, are largely absent from North East mines. Some miners, however, do argue that more powerful equipment makes the job of coal getting 'easier'. But they maintain that other parts of the job remain unaffected by this and that the 'skill' in the faceman's work is dealing with unforeseen situations and that these have by no means been eliminated by monitoring techniques. The point here is that 'there is nothing to it' if everything goes according to plan, but particularly on advancing faces in faulted ground with poor roof conditions, it rarely does go to plan. Miners at Westoe who have experienced work on the main producing retreater with its all-electric shearer, suggest that careful selection of geological conditions and high powered face equipment mean that performance

levels are high and that often an operator is reduced to 'running after the machine'.[15]

However, the Westoe fivequarter district is exceptional for the North East, not the norm, and even here, geological conditions are not completely stable. In general, therefore, it seems that faceworkers jobs remain unaffected by the process of deskilling. The same could be said for many backbye jobs. Many backbye jobs have always fallen into a clear semi- or unskilled category and therefore testing for evidence of deskilling is inappropriate. Skilled backbye jobs such as manset or shunter driving had not been altered in any significant way over recent years.

Arguably the greatest potential for deskilling lies in relation to craft-work. Again, for many craftsmen the issue of skills was not prominent. For them, as for miners, the key issues are the pay/effort bargain and the organisation of production time. Also, although craftsmen did harbour fears about the deskilling attributes of technical change these have not materialised in the expected way[16]. On-line condition and performance testing, for instance, was completely absent in North East pits. Similarly, the original fears of union activists, that

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[15]On a visit to the the main producing advance face in the fivequarter district at Westoe, my overwhelming impression was of a frenetic pace of work.

[16]Branch officials in general were aware of the work of the Bradford Group on deskilling through discussions at NUM day schools. Mechanics officials, in particular, stressed that the full scale assault on craft skills which they had been led to expect had not materialised.

routine condition monitoring might represent an attack on craft skills, by concentrating knowledge of the maintenance process in the hands of a few 'super-craftsmen' appeared not to have been borne out. Craftsmen involved in RCM are seen as part of the horizontal rather than vertical division of labour. Ironically perhaps, some of the tasks associated with RCM are among the most routine. For instance, it is the task of one worker at one colliery to repeat simple oil debris analysis tests daily in a small windowless room - hardly the work of a supercraftsman. In general craftsmen, especially fitters who are the bulk of the craft workforce, found it hard to identify ways in which the content of their work might have been altered.

To the extent that a deskilling issue exists, it clearly focuses on the degradation of electrical skills. This is related principally to the increased use of printed circuit boards in electrical equipment, which in turn is seen as leading to the reduction of the electrical skill to 'unit changes' (the loss of the diagnostic and analytical tasks), rendering the electrician a 'panel-changer'. It would be wrong to overstate the extent to which this process occurs in North East pits but a clear trend has been established. A face electrician explained the apparent advantages from management's point of view;

> What you've got to look at is the electrician on the face, especially on coal work, he's just there to keep that face going. He's there for breakdowns, nowt else. So the idea of having a few cases to change is obviously a good thing, The simpler, the better - to swap things over. They more or less become a monkey[17].

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[17]This view is supported by every craftsman I spoke to even those who were members of the UDM.

In most North East pits there is still a equipment which is operated by single wire systems and this requires 'old fashioned' fault finding skills. However, the trend is clearly in the direction of unit changes and the implications for skills seem clear cut. The same electrician said:

> Most electricians now...if it's a breakdown you know, it's a case of changing this module and try it, then you change that module, then you change this, then you change the interior... If you've got to get the drawings out now, its probably six months since you've last done one. So, you're probably having to go back to square one...normally its a last resort, that's what you've got to at the end. Usually you just change things until it goes. The time's gone when you've got to resort to the drawings, apart from small things. Those times are very few and far between and normally you've got a gaffer with you...you'll find most electricians just change a module or a card[18].

The discussion of electrical skills highlights a general point. Clearly there is a deskilling process at work, although workers seem curiously uninterested in it. However, the purpose of such changes is to speed up the process of fault finding as part of the general attempt to reduce downtime rather than the outcome of a control imperative as such. A certain dilution of craft skills can be discerned and it may be that this will continue and intensify. Although one might expect to find more widespread evidence of the impact of technical change on skills from pits developed around the principles of ATM (see Chapter Six).

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[18]A UDM craftsmen at the same pit made a similar point: 'If they've got a fault on a panel, you get on the phone and say: Such and such has gone down. And they'll say: Well take it out and put panel such and such in and see what happens...It decreases the skills that's needed. All you're doing is looking at the plan to see what card needs changing. You take it out and the card is sent away to be repaired. I mean previously what happened was you'd have to find the fault and repair it. So your skill isn't needed anymore'.

From the technical point of view therefore, the 1980s were characterised by incremental improvements in technology, which seem to be part of a longer term process of change designed to integrate the production process and to achieve higher face tonnages, but HDME strictly defined, and which is said by BC to underpin the technical transformation of the industry was conspicuous by its absence. In fact some technical change was simply a case of the mechanisation of activities which had long been the norm in other coalfields. Technical progress probably contributed to the increase in D.O.F., although this improvement is partly the arithmetical effect of closures. The most significant development is the concentration of production on fewer faces, a strategy which appeared to bring in its wake a series of related technical problems, notably in the area of coal clearance. Moreover, the forms of control and monitoring systems in use were limited in comparison to the trajectory of change outlined in the second half of Chapter Four. The impact of new technology on skills also was limited, although a clear tendency to the deskilling of electrical work was in evidence. The post-strike productivity improvement in North East, therefore cannot be ascribed to any major technological breakthrough regardless of what is claimed for BC as a whole.

5. RESTRUCTURING WORK PRACTICES

The post-strike offensive

The process of work intensification has been the central experience of North East miners since the strike. It was this issue which was raised time and again in discussions with miners, with the pace of work being seen as increasing dramatically. In general, the direct content of work has remained unaffected by recent developments but the range of tasks assigned to individuals was increased.

In a few cases intensification can be seen as a function of technical change. For instance, miners working on the main producing faces at Westoe, such as F33r, report that high performance shearers traverse the face so quickly that the associated tasks on the face - advancing the chocks, timbering in the face ends, etc. - now have to be completed much more quickly. The pace of work is variously described as exhausting or frenetic.

More generally, intensification has been a simple consequence of labour shedding. One manager claimed his pit was 'vastly overmanned' and the changed balance of power in the post strike period allowed this situation to be altered:

> The first half or two thirds of the people we divested ourselves of after the strike were doing jobs that didn't really exist or were jobs that we could get somebody else to do because of the change in attitude [on the part of the unions and workforce] or we could simply design out. The various planning moves - concentration of production in time and space - have helped us. In my time we've lost over a thousand men [since 1985]...There's been a certain amount of

> taking men away and officials and district management have had to find ways of dealing with it. Its a fairly brutal approach, but in an industry like this its one that works.

This is part of an apparent attempt to match the workforce exactly to the number of jobs at the pit, with no extra men for contingencies (traditionally seen as inevitable). Under this approach unforeseen circumstances are managed through the use of overtime. Through this strategy management in most pits have been able to maintain levels of output with much reduced workforces (see Table 5.2 for a representative example). This strategy has a number of implications among which is the necessity to restructure working practices and working time. A branch official gave one example of the consequences of this strategy:

> ...on the Dosco's that we've been talking about, [in the major tunnel developments] the big Titan tunnellers, you'd have three of four men working in that heading and their job was to drive it. And they'd be supplied with girders and timber, to timber it up and everything. There'd be another set of men doing refuge work, following them in doing refuge holes. Since the strike they have reduced the number of men from four to three - three men working in the heading. They're doing all the bricklaying, doing all the refuge holes and walking out maybe 200, 300, 400m to collect supplies and bringing them in...spending less time on the job they are supposed to be doing because they're doing all the ancillary tasks.

Such developments affect all workers in the pit. The processes affect underground craftsmen. According to an electrician:

> ...the pit is an expanding thing - we are now 11km out - so there's more equipment, more stuff to cover, and a lot less men to do it. Once upon a time we used to have a situation of one man per heading, where a man would go into his heading or coal work, maintain that heading, maintain that machine, move everything in. Now that's not the situation regarding fitters or electricians, where you might have two or three headings to cover per shift besides any installation or salvage work he has to do back-bye.

Management are continually examining ways of merging jobs in all parts of the pit, but especially backbye and on the surface. At Westoe management proposed to abolish the separate job category of manset guard and train a pool of men from other job categories and, in addition to their existing tasks, to assign these men to guard the manset at the beginning and end of their shift. On the surface at Wearmouth management had craftsmen trained to operate forklift vehicles in order to reduce the number of specialist forklift drivers[19].

Perhaps the most dramatic change in the organisation of work since the strike has come at the surface where BC has adopted a strategy of subcontracting an ever wider range of tasks. This policy has mainly affected craft-workers and has led to the virtual elimination of some trades from the pit workforce. At both Wearmouth and Westoe, for instance, nearly all blacksmith work is now contracted out to local firms for fabrication. On occasions this involves 'faxing' a drawing of a piece of work to more than one firm in order to obtain a competitive price for the work in question. At Westoe this had led to a reduction in the number employed in the pit's blacksmith shop from over twenty to six in 1990. Other trades such as bricklaying have also been badly hit by this process. This represents a major change in the post strike period, because unlike other coalfields the North East never had a

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[19]The Mechanics at Wearmouth opposed this proposal. However, at Wearmouth there is a significant presence of members of the strikebreaking UDM, who were concentrated among surface and craft grades and who agreed to the proposal, and the colliery management were able to press ahead.

tradition of using contractors except for the most specialist tasks. Indeed it was custom and practice before the strike for management at some pits in Durham to send proposals to use contractors to the union who would vet the job in question. Just prior to the strike the Mechanics Unions at Westoe and Murton vetoed several such contracts and organised their own members to do the work.

The restructuring of working practices in the post-strike period, by all accounts, was dramatic. All groups of workers were affected and there is little doubt that a general intensification of the work process occurred. Moreover, through the institutionalisation of subcontracting on a large scale, this is likely to have changed the character of pit work forever in the North East.

Incentives

The restructuring of work practices has been accompanied by changes to the operation of the incentive scheme. For Richardson and Wood (1988) changes in incentives (notably the introduction of the Doncaster Option) were the central factor in explaining the productivity rise. Moreover, acceptance of such changes by the mining workforce was seen as reflecting the abandonment of collective attitudes. Traditions of solidaristic wage bargaining were a historical feature of the North East (see section two). Significant alterations have been made to the system of incentives prevailing before the strike, but this section suggests that these have been aimed at weakening workplace trades unionism and eroding union operated job controls, rather than reflecting

a more 'individualistic' attitude on the part of the workforce, and reflected management's ability to play on workers justified fears about pit closures.

Conventionally under the incentive scheme, each development and face in the pit is set a standard task based on rate of advance. If the men achieve this task they receive a standard bonus. If they achieve more, they earn an increasing bonus calculated on a sliding scale. Originally the local workforce could elect to operate one of two systems. In the first, each face team earned the same bonus, calculated by averaging the bonuses earned by all of them. In the second, each face team earned a bonus based on the performance of its own face. Typically, in the North East pits operated the first system of pooled earnings, a system in keeping with the traditional marra relation (see section two). Craftsmen, backbye workers, development workers engaged in hazardous work and men working at bank, earn a 'derived' bonus based on a percentage of the average bonus achieved on all the faces (the 'colliery average') which is determined by the worker's grade and which amounts to a percentage of the colliery average (either 100, 65 or 50 per cent). Generally the scheme allowed management to introduce and consolidate wage differentials, based on variations in production levels, which in turn reflect geological factors and past investment decisions. There were a number of key changes which have altered the operation of the system in the North East after the strike. However, completely new packages such as the Doncaster Option (see Chapter Four), where the payment for advance principle is replaced by payment based on tonnage and cost performance and payments for production delays

except in the case of major shift breakdowns, had not been introduced. The changes which have occurred since the strike have been made possible by the fact that bonus payments have come to play an ever increasing proportion of the weekly income of miners (see Chapter Four). The achievement of good bonus becomes essential to the maintenance of the miners' standard of living. Such a situation, according to union officials, leads to a breakdown of the discipline which traditionally surrounded local bargaining over effort and wages in the North East. In general, in the pre-strike period the high level of control over the organisation of work which was exercised by Lodges, meant that some of the divisive aspects of the incentive scheme were mitigated.

For instance, at Westoe prior to the strike, the NUM Lodge was heavily involved in the selection of face teams. By drawing on the traditions of cavilling the Lodge attempted to ensure that all face trained men were given an opportunity to work on faces which had the potential for good bonus earnings. The aim of this was to mitigate the divisive effects of the existing bonus scheme. According to the Lodge chairman:

> It was one of the best systems you'd find. It wasn't the strict cavilling system, but it was what we called the cavilling system. More or less what happened was the team moved en bloc from one face to the next. What we used to ensure that those who had been spare on the exhausted face, on the new face would get a place on the team and somebody would become spare. We are trying to win back little bits of it. But you know, we have not got the system that we had prior to 1985.

While the cavilling system at Westoe was the basis for equitable earnings, it was seen more generally as contributing to the solidaristic work tradition for which Westoe was noted[20].

Management at Westoe opposed this practice which, according to a senior member of management, militated against good discipline because 'square pegs were fitted into round holes'. In the immediate post-strike period, management, taking advantage of the changed balance of power at the pit, stated their intention to abandon the old system of team selection and to pick the teams themselves. The Lodge, therefore, lost its ability to undermine the effects of the bonus system through its control of job allocations[21].

A similar process occurred at Dawdon where the colliery manager explained poor performance in the C seam:

> ...the major problem at Dawdon was the face teams pooled their incentive bonus payments so that there was no direct relationship between effort and rewards. The union (NUM)

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[20]Westoe was regarded as a traditionally militant pit, conforming to the stereotype of Tyneside pits (cf. Douglass, 1977). Westoe's militancy was exemplified by the series of well publicised short strikes in the period prior to the miners' strike and by the high level of support for industrial action - in relation to the new disciplinary code and in support of sacked miners - after the strike (see Renouf, 1990, for a fuller account of these episodes).

[21]The elimination of cavilling in this case had wider ramifications as the Lodge official made clear: 'Well it frightened the men when he started to pick his own teams. Lads were frightened to stop off. We had a situation where management wanted mid-week shearing because one face had went down and they were doing very badly towards the end of last year [1988]. We actually had men who've never worked overtime, but worked that mid-week overtime because they were frightened they wouldn't get picked for the next team'. I return to other implications of this conflict later in the chapter.

> was approached with a view to the faces being paid separately but they opposed this on the grounds that management were trying to destroy any power or control the unions had, and in their opinion, set worker against worker (Parkins, 1989: 535).

Parkin and his management staff visited the faces to advocate an individual face bonus and stressed its importance to the future viability of the pit. He reports that: 'Pressure from the faceworkers eventually forced the union to hold meetings where the men finally voted to be paid on an individual basis' (ibid 535-6). In the week following the acceptance of the new system Parkin reports that output rose by 5000t. Later though geological problems stopped the face in question, indicating the extent to which the determinants of output lie largely outside the hands of face teams[22].

In neither the Westoe nor the Dawdon case, however, did management produce any real evidence of how union involvement in the selection of face teams or pooled bonuses actually impacted on productivity or how their alteration of these practices, other than eroding the influence of workplace trade unionism would improve productivity. In discussions with managers, however, talk of 'restrictive practices' was common and changes such as those just mentioned were offered as examples of how managerial prerogative, deemed essential for economic survival, had

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[22]In general, changes in the bonus system were accompanied by a tightening of task standards. Whereas prior to the strike it was possible to dispute task standards and this was done frequently at Westoe, standards began to be determined 'synthetically' on the basis of the known performance of machines derived from field trials and so on. These changes both reflect and contribute to the changing balance of power at the pit.

been regained. The extent, however, to which the more stringent operation of the bonus system has had an impact on productivity remains unclear. Lodge officials and union activists suggest that face teams are now highly motivated by the prospect of good bonuses, but also how the divisiveness of the changes to the bonus system created new problems of demoralisation away from the face.

The main feature of operation of the bonus system after the strike has been the extent to which it has led to division between different elements of the mining workforce. At some pits face teams have been given payments over and above agreed bonus, in the words of one informant, 'for showing willing'. In the view of many union officials rates of advance (on which bonus payments are based) are only marginally determined by effort rates and depend ultimately on geological and technological factors over which face teams have only limited control (cf. the Dawdon case above). Moreover, workers elsewhere below ground remain on derived bonus. In effect the combination of these factors creates the possibility for unfairness and division which the old systems based on cavilling and marra principles attempted to ameliorate. A one Lodge official put it:

> I'll be quite honest about it here, some of the faces, there's not a powerloader on them on less than £15 per shift [bonus]. What happens is that on the sheet it'll show he's getting £6 or £7 but then they get a backhanded payment as well - on the note, mind. The undermanager will say: why you tried you haven't got your standard, so we'll give you a few extra bob. The problem of course is that that money doesn't go into the divisor...Now when they pay backhanded payments the powerloader is being looked after - he's the

core worker - but the backbye lads are getting robbed every week[23].

A senior management figure at one pit acknowledged that the low level of bonus for backbye workers means there is demoralisation among these workers and speculated that the problems of advance faces could be ascribed to the lack of motivation on the part those responsible for supplying materials to the headings. In his view productivity on such faces would be much improved by developing a system of 'individual merit payments' for these men[24].

The level of discontent over the operation of the incentive scheme remained high among workers but its fragmented nature and the lack of national leadership on the wages question, made it hard for Lodges to translate this into industrial action. Many union activists saw what little remaining influence they have in area of local bargaining slipping away. Management at Wearmouth proposed to the mechanics union a list of ten

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[23]The comments of a Lodge official at another pit offer corroboration of this general point: '...taking my own pit as an example. Face workers can make good bonuses. Those on drivages can't make fantastic bonuses. Then, of course, you've got those who are on derived bonuses, those who get the 100 per cent, the 65 per cent and the 50 per cent, datal lads - people like that. And so, therefore, if you see for example, face teams or developments teams getting £26 per shift and the colliery average is £12 and you are only getting 65 per cent of that £12, it leaves a lot of discontent. It obviously leaves a lot of divisions because, of course, those who are on datal work and transport work can't get face trained; men who started at the pit at 16 who are now 25 and it doesn't look like there is any prospect of them getting trained'.

[24]The intra-pit divisiveness of the bonus system is not addressed by Richardson and Wood (1988) who concentrate on the implications of the scheme for faceworkers. Most workers are not faceworkers though. Rates of pay among backbye and surface groups remain low even with bonus.

tasks to be undertaken by craftsmen for which they would be paid on a one-off basis. The tasks included cleaning box-ends, laying way and laying pipes, tasks normally outwith the responsibilities of craftsmen. For want of an alternative and in order to retain some union sanction the Mechanics Lodge negotiated a deal. In such circumstances, however, it becomes virtually impossible for the union to even be aware of what their membership are being paid and thus it becomes impossible to regulate work practices in the cavilling and marra tradition.

Reorganisation of working time

The reorganisation of working time has perhaps been the most contentious of the post-strike issues both nationally and in the North East. The issue of production time is closely bound up with other technical and social changes which have occurred in the post strike period. Nationally, BC has made clear its desire for extended production time, justified by the need to achieve higher utilisation rates for expensive equipment. In the North East the argument was advanced by BC in relation to the peculiarities of undersea mining (see section two). The fact that extraction takes place at ever further distances from the shaft means that an ever decreasing part of the average shift is devoted to directly productive activity and a greater proportion to travelling. In practice in North East deep-mines the question of production time manifests itself in two main ways, firstly through attempts to make a greater part of the existing working day directly productive and, secondly, through attempts to extend the working day.

BC's efforts to increase the directly productive part of the working day focus on attempts to improve two principle indicators: the shift index and machine available time (MAT). Such a strategy involves both technical and social factors. MAT refers to that theoretical part of the shift or working day during which face equipment should by available for operation. In North East mines MAT is limited principally by the combined effects of long travelling times between shaft bottom and face (up to 11km) and mining legislation which limits the length of the official working day to seven and half hours plus one winding time. In practice, therefore, attempts to increase MAT have focused on attempts to transport men to their place of work more quickly. For instance, miners report that discipline at the shaft bottom manset stations is much tighter now than it was previously:

> Once you've ridden and you're at the shaft bottom there's no hanging about like there used to be...you're on the manset straightaway and the emphasis is definitely on getting you inbye as fast as possible and getting you on the face.

In addition the practice of shift changeovers occurring at the shaft bottom was eliminated. Instead shift changeovers at the face eventually were instituted in all North East pits[25]. A range of other practices born of long tradition, but indicating a high degree of workplace

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[25]Although travelling discipline may have been increased, BC's own figures suggest that MAT increased by about 10 minutes 1985/86 to 1987/88 (see Figure 5.8) although this is a more impressive achievement than it at first appears if it is borne in mind that faces are increasingly distant from the shaft. However, it is in the period since these figures were produced that the reforms of working practices described above have occurred, although BC have produced no exact quantification of their effects, but there is no reason to contradict national evidence that progress in improving global MAT figures has been slow (see Chapter Four).

control have also been eliminated. At Wearmouth historically machines were stopped during the faceworkers' bait time; a practice since abolished. Also at Wearmouth working to stint in development headings has been eliminated[26].

The effects of the bonus system and centralised monitoring, as well as increased management confidence may also help to increase MAT. At one pit:

> Prior to the strike, it was custom and practice to have a bit of bait or a cup of tea at the start of the shift. That doesn't happen now. You get to the face and lads start working straightaway. You'll get lads working through their bait. With the bonus the way it is, if you're not working you're not earning. And with FIDO you've got the control room asking straightaway - why is the shearer not moving? Or you've got a deputy breathing down your neck.

Lodge officials invest a great deal of hope in the potentialities of new manriding systems in warding off the possibility of longer shifts. At Westoe colliery a method study report showed the time gains achieved

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[26]A miner who transferred into Wearmouth from a pit which had closed explained this system with more than a hint of bemusement: '...they had particular system where if you were a caunchman you had one part of the cycle to do. If you had to like fill the stone away and put the girder up that was your job. When that was done you were finished. You used to have the spectacle of men doing their bit because they only had a thin caunch that day, getting the stone away and they'd sit down'. The mechanisation of heading work provided the opportunity to eliminate this practice. According to the same man: 'They also had another system through there, where if you're on the face you've got say like fifty chocks and they're your fifty chocks. You dinna gan all the way down the face pulling them in and ramming them. You just do your fifty and somebody does another fifty and somebody else does another fifty. That harks back to the day when men used to get cavilled and they used to be drawn out for different parts of the face. If you got a bad cavil you couldn't make your money: Oh champion I'm in the maingate end or I've number 5 section, you nar. That's not bad I can get my coal there. Mind, if he drew a bloody bad cavil he couldn't make his money, like'.

by the introduction of new heavy duty battery locos using upgraded tracks and related systems which are being introduced into the colliery and which will add an estimated 40 minutes of MAT[27]. Indeed managers have suggested similar possibilities (Harrison, 1989). However, the development of manriding (and material haulage) systems suitable for the undersea conditions of the North East has not been at the centre of BC's strategy of technical change.

The second attempt to increase production time within the broad confines of the existing working day concerns attempts to improve the shift index. The shift index is the measure of the proportion of all shifts which are machine shifts (ie, not ancillary shifts). Available figures show that in the immediate post-strike period the shift index stood at less than two but that by the first quarter of 1988/89 it had risen to 2.24. (Comparisons with the pre-strike period are problematic). A concerted effort was made on the part of managers to reduce the number of ancillary shifts and it is likely that the figure of 2.24 has slowly been improved. For instance, before the strike Wearmouth operated seven faces with twelve coaling shifts. This was progressively altered until four faces were operated on eleven coaling shifts (increasing the shift index from 1.7 to 2.75). This strategy is an essential part of the 'concentration of production in time and space' (Harrison, 1989) and is likely to account for a large part of the observed improvement in D.O.F..

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[27]'Investigation of Manriding System with the Introduction of BoBo locomotives', August 1989, by Colliery Method Study.

How do collieries manage to operate with fewer preparation shifts? The common explanation given by managers is 'improved maintenance procedures'. In particular, the roles of routine condition monitoring and other forms preventative maintenance were stressed. The argument is that such techniques allow the careful planning of pre-emptive maintenance procedures outside of production time rather than the adoption of a crisis-response situation. Some support for this view is suggested by Figure 5.9 which shows the reduction in non-planned shearer section breakdowns in the North East collieries following the introduction of routine condition monitoring as part of an Area initiative in 1987/88[28].

BC attempted to increase production time through formal and informal attempts to lengthen the working day. In the immediate aftermath of the strike senior BC figures on a number of occasions publicly stated their wish to see the introduction of 9 hour shifts in North East deep-mines. BC argued that such a shift arrangement would give rise to an extra 30 per cent of MAT (eg House of Commons, 1986; The Journal, 27.5.86: Financial Times; 30.11.88). Such shifts would be

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[28]Parkin argues that at Dawdon there was a 'disastrous situation regarding breakdowns. In order to combat the situation all breakdowns were logged (manually at first, now by computer) under the various categories, ie face machines, AFC, outbye, etc. A pattern of breakdowns soon showed the failure of the Eickhoff shearer components as being the most serious. This was further compounded by the fact that a breakdown in the middle of a thin seam face can take up to a week to repair. In December RCM was set up, starting with oil debris sampling on CO3 face's Eickhoff shearer. This has been developed over the last two years to cover all production units, coal clearance systems and supply haulages. Since April, 1987 no oil related production failures have occurred' (Parkins, 1989: 536; see figure 5.10).

intended to operate over a four day cycle ensuring coal production over six days. The introduction of such a shift system would require the repeal of existing mining legislation (which limits the extent of the working day to seven and a quarter hours plus one winding time) and the abolition of the Five Day Week Agreement negotiated between the NCB and NUM in 1947 (which prevents coal production on Saturday and Sunday). However, in neither case have formal attempts been made to replace these existing arrangements with new agreements.

Instead in the North East BC has concentrated on highly localised attempts to undermine existing agreements and practices in an effort to extend direct production time through 'voluntary overtime'. In practice two issues can be identified. The first concerns 'mid-week coaling between shifts' and the second 'weekend coaling'. Officially the regional and national NUM remains opposed to both practices. Their opposition is based on two factors. Firstly, they are seen as leading to the introduction of 9 hour shifts by stealth and these are opposed on grounds of health and safety. Secondly, extended coal production is seen as fatal in a situation of contracting markets. The practice of extended coal production was already widespread in other coalfields (notably in the central area) but took much longer to be established in the North East.

However, mid-week shearing between shifts has become an established norm during the course of 1989 in all North East pits. From BC's point of view the breakthrough seems to have been achieved at Easington colliery where the practice was established earliest. This is indicated

in Figure 5.11 which compares the percentage of shifts worked which are overtime shifts for the period 1985/6 and June 1989, showing the very high rates of overtime being worked at Easington. Once one pit was engaging in this practice it proved very difficult for the NUM to prevent its further adoption, especially when fears of closure were rife.

A major breakthrough for BC came when mid-week shearing was established at Westoe colliery during the production crisis associated with the introduction of the heavy duty shearers mentioned earlier. This represented a coup for BC because of the militant reputation of the miner's Lodge at Westoe. The establishment of mid-week shearing between shifts and the associated growth in overtime working, therefore, accounts for a significant increase in D.O.F. and hence productivity.

Weekend coal production remained less significant in the North East coalfield, but became an important issue in events at Wearmouth colliery. BC management raised the issue of flexible working at Wearmouth on a number of occasions following the end of the 1984/5 strike. Attempts were made to institute 24 hour coaling in late 1987 when G92s face hit geological problems (see Sunderland Echo, 26.8.87). This led to a vigorous response on the part of the local NUM Lodge which forced BC to withdraw the demand. In 1988 further attempts were made to initiate coaling outside of normal production time in this case during the holiday period. Again geological conditions - on H201s - were cited as the reason. The Lodge responded with a threat to withdraw safety cover at the pit (The Journal, 22.7.88, Sunderland

Echo, 25.8.88). During 1988 management raised the subject of longer shifts at the pit 'deputation' meetings. Later the issue surfaced in most dramatic form when 300 miners at the colliery walked out after six men were sent home by management for refusing to carry out coaling on J39s during a weekend shift (see Sunday Sun, 13.8.89.). The response of the colliery manager, using a tactic developed during the miners' strike, was to send leaflets to the homes of each employee outlining his plans for weekend coal production and the danger to the pit's future if this was not instituted (The Journal, 18.8.89). The union responded to this by introducing an overtime ban (Sunderland Echo 25.8.89). (For one interpretation of these events see The UDM Miner, September 1989). The overtime ban was eventually lifted to allow negotiations to take place with management. A compromise agreed at the area level between Area officials and management allowed limited coaling between shifts during the week to make up abnormal production losses. Although deeply unhappy about this settlement Wearmouth Lodge officials, in the absence of leadership at the regional level to spread their action, felt compelled to accept it. In the aftermath of these events it is clear that coaling in overtime became established at Wearmouth[29].

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[29]In the process a further set of union operated job controls died. At Wearmouth the union had controlled the distribution of overtime through the operation of 'the six hour rule', which specified that no man could work more than six hours overtime per week. The aim of the rule was to ensure that all workers had the opportunity to make extra earnings. It reflected an antipathy toward 'overtime bandits', held especially by faceworkers, and often directed at craftsmen, some of whom were held to 'practically live at the pit'. (Indeed one UDM craftsman told of how he regularly worked a six or seven day week, arguing that

(Footnote Continued)

Although a plateau was reached in North East mines with the universal institution of coaling in overtime, the pace of introduction of these new working arrangements was highly uneven. This unevenness reflects local political factors. At Easington, where BC's breakthrough first came, it seems a tradition of accommodative industrial relations proved fertile ground for the testing of the new working arrangements. Once the wall of opposition to new working practices had been breached at one pit, it proved very difficult for Lodges at other pits to resist management.

At Westoe it appears that management waited until a crisis emerged in the Lodge leadership following the resignation of a branch official before making a concerted push to introduce mid-week shearing between shifts. The breakthrough at Westoe was a major coup for BC because of the Lodge's reputation for militancy. It is perhaps surprising, therefore, that the most protracted and bitter rearguard action against the new working arrangements was fought at Wearmouth, with a reputedly moderate Lodge and the only pit in the region with a sizeable UDM presence. This can be explained by the emergence of a campaigning Lodge leadership at the colliery in the post-strike period. Whereas the Westoe Lodge leadership was characterised by instability and several changes of personnel, Wearmouth had a relatively stable and continuous branch leadership which adopted a vigorous opposition to new working practices and conditions. Through a regular branch

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(Footnote Continued)
for him overtime was 'a way of life'). The activities of the UDM had already begun to erode both the purpose and effect of the rule.

newsletter the Lodge committee attempted to counter management BC arguments over flexible working and other issues, with at least some apparent success.

6. CONCLUSION

The increase in productivity in the North East coalfield after the 1984/5 miners' strike reflected an increase in average D.O.F. achieved with a steadily declining workforce. This improvement was achieved with only a marginal utilisation of the heavy duty face equipment which has been at the heart of BC's technical strategy, and which has been widely used elsewhere. Indeed in some cases technical change in the North East amounted only to the mechanisation of tasks which were the norm in other areas. Other factors did play a part in this process, notably in the form of longer faces and the move to retreat mining and re-use of pre-driven gateways, though this process amounts to restructuring of capacity rather than the introduction of new technology. Moreover, this was facilitated by the increased concentration of production in areas of good geology and the abandonment of areas thought likely to be associated with unacceptably low extraction rates and high production costs (regardless of ecological costs), which had the effect of overstating the contribution of technical change in the productivity improvement. Higher outputs were used to justify the concentration of production on fewer faces, although the reduction in faces was also used to stimulate the search for higher face outputs. The problematic nature of this strategy was reflected in the production crises at Wearmouth and Westoe. Lodge officials expressed their doubts about

the viability of this approach as a long term strategy. Higher D.O.F. brought in its wake a series of technical problems associated with coal clearance. Whatever incremental changes may have occurred it seems clear that improved productivity has not been a result of a technical breakthrough[30].

Information technology had limited application in the North East coalfield, mainly confined to the automation of some routine tasks and its monitoring capacity largely limited to the STOP/START functions, although this allowed limited forms of delay analysis. Surveillance systems such as FIDO cannot be used to explain any process of intensification at the face. Miners invariably identify the post strike period as the one in which effort rates increased, yet most surveillance systems pre-dated the strike. As far as the impact of technical change on craft skills is concerned, the evidence derived from this case study would lend more support to the prognostications of the Bradford Group

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[30]This is not deny that some important technical change did occur, though this has tended to be concentrated in one or two pits (notably Ellington and Westoe). At Ellington and Westoe, for instance, the introduction of all-electric Eickhoffs is significant. In Ellington's case the machine reportedly ran for 98 per cent MAT following commissioning, producing one third of the pit's output (Colliery Guardian, February, 1990: 34). Westoe saw the introduction of one of the largest single runs of 11kV cable in a UK mine. This project was part of an electrical refurbishment of the mine and the replacement of 3.3kV and 6.6kV systems (Power Engineering Journal, January 1989). Also, the introduction at Westoe of the rapid loading system (at a cost of £4.2m) and a tube conveying system for transport of waste to Harton Staithes (replacing the antiquated and unique internal electric railway) were important. Both of these investments were welcomed by the NUM as an act of faith in the pit (eg The Journal, 24.2.88) although in each case substantial job losses accompanied the investments, see tables 5.5 and 5.6.

(1985) rather those of Penn (1990). A clear tendency toward deskilling is at work and is understood as such by miners of varied political outlook. However, the introduction of module maintenance seems less a product of a simple desire to 'control' the craft labour process than to speed up repair processes.

The origins of the productivity improvement in the North East, therefore, can be said to lie in the process of labour shakeout and the reorganisation of work practices leading to work intensification. This process was the outcome of the defeat of the miners' strike and, significantly, of the divisive effects of the operation of incentive schemes. (Although the evidence that the operation of the incentive scheme itself has contributed to improved productivity remains ambiguous). BC's real breakthrough has been its success in forcing through new working practices and arrangements. What is remarkable, however, is that given the balance of forces prevailing in the post-strike period the North East Area NUM has been able to put up some resistance.

Throughout the post-strike period Lodges were involved in a continual rearguard action against closure. Conscious of the real threat of closure hanging over many, if not all, North East pits, local unions, often with tacit sanction of the regional level, allowed changes to working practices to be made in an effort to secure 'viability'. Throughout this period, there was a growing acceptance of arguments about the necessity of profitable production in order to secure the survival of pits, while Lodges, often unsuccessfully, sought to maintain

a residual influence in the affairs of the pit. This represented a cultural revolution from the nationalisation period and corresponds closely to the definition of 'market corporatism' suggested by Gibbon and Bromley (1990; see Chapter Four). The cavilling traditions of job control based on principles of equity and fairness were one important casualty in this process. In all cases, though, these changes occurred without any alteration to formal bargaining structures[31].

It is striking that management often made breakthroughs on working practices in times of production crises caused by geological or technical difficulties. At these times management approached unions to agree alterations to working practices in order to overcome particular problems. However, Lodges found it difficult to stop such temporary concessions becoming the norm long after each crisis had passed. The process of change at Westoe followed this trajectory. On occasions when management could not secure union acceptance for altered work practices they frequently resorted to direct communication with the workforce (as happened at Wearmouth), a tactic first employed during the miners' strike and later consolidated into the everyday repertoire of management practice.

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[31]'Market corporatism' had become the order of the day at more militant Lodges such as Murton where the socialist leadership were engaged in an 'organised retreat'. Even at Wearmouth, where a well publicised battle against coaling in overtime occurred, important reforms in shifts had already occurred in relation to the major drivages to the high coal (see section 3). Travelling time from the shaft bottom to the drivage headings took up to one hour. Conscious of the importance of the development to the long term survival of the pit the Lodge agreed to heading teams handing over at the work place rather than at the shaft bottom.

British Coal's productivity miracle in the North East, in relative terms has been based on low levels of investment and highly intensive exploitation of labour. Paradoxically, this strategy brought the North East coalfield into profit for the first time since nationalisation. The North East coalfield produced lower cost coal than the North Yorkshire area (including the Selby complex) in 1989, although the latter had a higher level of productivity. (North Yorkshire's costs of production were £1.54 and overall OMS was 5.26t; the comparative figures in the North East were £1.43 and 3.91t.) This reflects the high level of capital charges resulting from the capital intensive mining operation pursued in North Yorkshire. Perhaps the greatest irony of this situation is highlighted even further in Table 5.7 which shows that in the North East the collieries with the lowest capital charges (ie most under-invested) produced the lowest cost deep-mined coal in the country. . Despite this performance, however, the dependence of the North East coalfield on the CEGB's Thameside power stations for its principal markets, and the decision of the privatised electricity generators to gradually reduce purchases of British Coal output to 65mtpa, continued to pose a real threat to the coalfield producing the country's cheapest deep-mined coal.

Events since the completion of the fieldwork on which this chapter is based have a bearing on the arguments outlined above, and in particular, illuminate the fragility of the productivity improvement since the strike. In the summer of 1991 Dawdon colliery - in 1988/9 the cheapest producer of coal in the region and hitherto held as an example of successful restructuring (Parkins, 1989) - was closed, allegedly on

grounds of exhaustion, with the loss of its 600 remaining jobs. More significantly BC announced that it planned to close Murton colliery with the loss of 1,000 jobs. Murton ran into difficulties after hitting severe geological problems in its main producing face which led to accumulated losses of £3.6m after April (The Journal, 14.8.91). The closure was announced by Brian Wright, the new area director of BC who had recently left the same job in South Wales where employment in the industry had been reduced from 26,000 to 4,000 in the post-strike period. At Murton the unions accused BC of 'mismanagement' arguing that the face in question was poorly designed, at too great a length, in order to maximise output. The unions had raised their misgivings about the planned face before it began production, but management pressed on. The unions were committed to opposing the closure on the grounds that the geological difficulties could be overcome, and the losses turned back into profit and at the time of writing were preparing an alternative mining strategy for the colliery to present to BC North East Group. From the unions' viewpoint the current crisis at Murton stands as testimony to the flawed nature of the mining strategy pursued by BC since the end of the strike.

The broader significance of these developments in relation to the main themes of this thesis are discussed in Chapter Seven. Chapter Seven also compares and contrasts events in the North East with those in the modern Selby complex of mines. Events at Selby are the subject of the following chapter.

TABLE 5.1

NORTH EAST AREA

Costs of Production (£/gj) 1985/6 - 1988/9

	Operating Cost	Bottom Line Cost
1985/6	1.95	
1986/7	1.58	
1987/8	1.48	1.55
1988/9	1.42	1.49
1989/90*	1.53	1.53

* Change of definition to cash cost per gj.

Source: British Coal data, privately supplied.

TABLE 5.2

NORTH EAST AREA

Main Production Indicators 1982/3 - 1988/9

	1982/3	1988/9
Operating Collieries	18	7
Saleable output (000t)	12,511	10,348
O.M.S (t)		
Production	8.77	18.69
Overall	2.09	3.91
Faces	61	32
D.O.F (t)	747	1,290
Men on books	21,600	11,100

Source: NCB/British Coal, Report and Accounts 1983/4 - 1989/90.

TABLE 5.3

WESTOE COLLIERY:

Main Production Indicators

	Saleable output (tonnes) Total(000s)	Daily	Face Shifts (%)	Over time (%)	Average Manpower	O. M. S Face	Overall	Operating cost/gj (£)	Bottom line cost/gj (£)
1983/4	1195	5689	18.9	6.9	2360	13.58	2.71		
1984/5	S T R I K E A F F E C T E D Y E A R								
1985/6	1026	4331	16.9	6.6	2204	12.45	2.25	2.14	
1986/7	1492	6402	17.3	9.2	2106	18.70	3.41	1.53	
1987/8	1464	6312	16.7	10.0	1907	20.91	3.66	1.52	1.61
1988/9	1407	6065	17.1	14.8	1604	20.75	3.74	1.63	1.74
1989/90 (three months)		6876	17.1	19.2	1538	24.09	4.36	1.42	1.51

Source: British Coal data, privately supplied.

TABLE 5.4

NORTH EAST AREA

Face Results, September 1989

COLLIERY	FACE	TONNES/DAY	OMS(t)
(ADVANCING)			
Westoe	F36	2178	40.46
Murton	E78	2057	40.43
Easington	J21	1955	33.09
Wearmouth	H49	1510	23.70
(NATIONAL AVERAGE)		1348	25.35
Vane Tempest	C11A	1241	28.55
Wearmouth	J39	906	13.51
Dawdon	C50	802	29.48
Westoe	H24	777	15.33
Ellington	K261A	661	8.69
Wearmouth	H201	630	10.27
(RETREATING)			
Westoe	F35	2867	68.40
Ellington	K17	2674	-
Wearmouth	G822	1988	40.12
Easington	G12	1735	33.14
Easington	E14	1674	33.81
(NATIONAL AVERAGE)		1666	43.33
Murton	E102	1650	39.06
Dawdon	C05	1625	49.24
Easington	J76B	1383	25.80
Vane Tempest	C27	1134	36.15
Dawdon	G36	926	15.03
Vane Tempest	C26	875	28.25
Ellington	K16	805	14.18
Dawdon	C11	677	31.11
Dawdon	C27	599	33.77
Easington	F02	550	19.31
Westoe	H612	503	20.40
Murton	C33	432	11.75
Dawdon	C09	416	17.23
Vane Tempest	C33	372	13.13

TABLE 5.5

WESTOE COLLIERY

Manpower Requirements of Rapid Loading System

Function	Previous Manpower	Present Manpower	Saving
Wagon Handling	24	18	- 6
Staithes	18	9	- 9
Drivers and Guards	27	14	-13
Traffic Control	8	5	- 3
Crossing Keeper	1	1	0
Foreman	4	4	0
Plate layers	13	7	- 6
Wagon Repairs	4	3	- 1
Craftsmen	22	15	- 7
Total	121	76	45

Source: Watson (1990)

TABLE 5.6

WESTOE COLLIERY

Manpower Requirements of Tube Conveyor System

Function	Previous Manpower	Present Manpower	Saving
Wagon Handling	18	0	-18
Drivers and Guards	14	0	-14
Traffic Control	5	0	- 5
Wagon Repairs	3	0	- 3
Craftsmen	15	6	- 9
Foreman	4	1	- 3
Labourers	7	3	- 4
Staithes	9	6	- 3
Crossing Keeper	1	0	- 1
Total	76	16	60

Source: Watson (1990)

TABLE 5.7

NORTH EAST AREA

Average Capital charges & Bottom Line Costs of Production

	Average Capital Charge for 27 months to June 1989(£/gj)	Bottom line costs (£/gj) 1989
Dawdon	0.06	1.33
Easington	0.07	1.51
Ellington	0.08	1.37
Murton	0.04	1.53
Vane Tempest	0.04	1.48
Wearmouth	0.11	1.82
Westoe	0.10	1.51
Group	0.07	1.51

Source: Calculated from British Coal data, privately supplied.

Figure 5.1

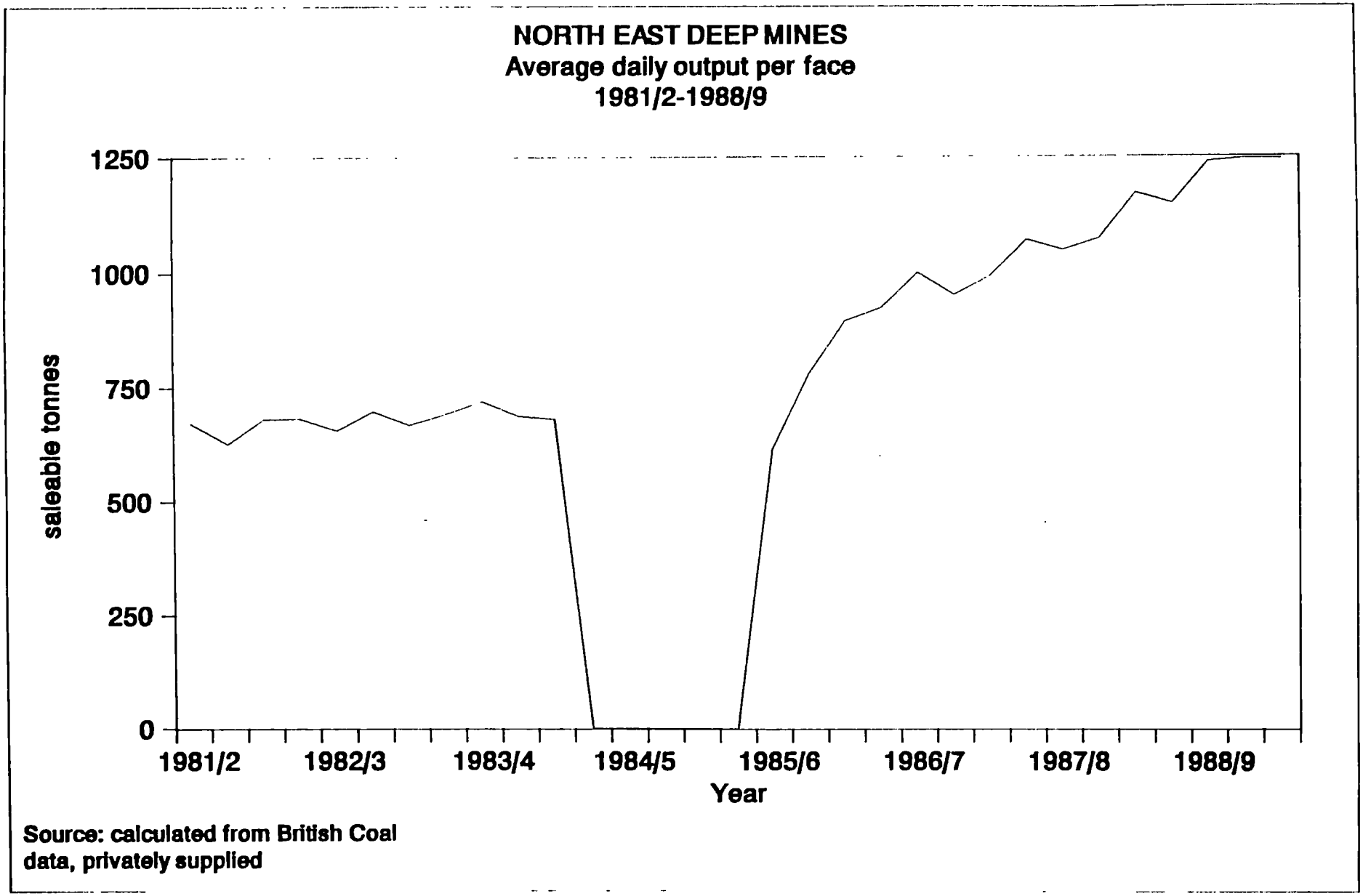
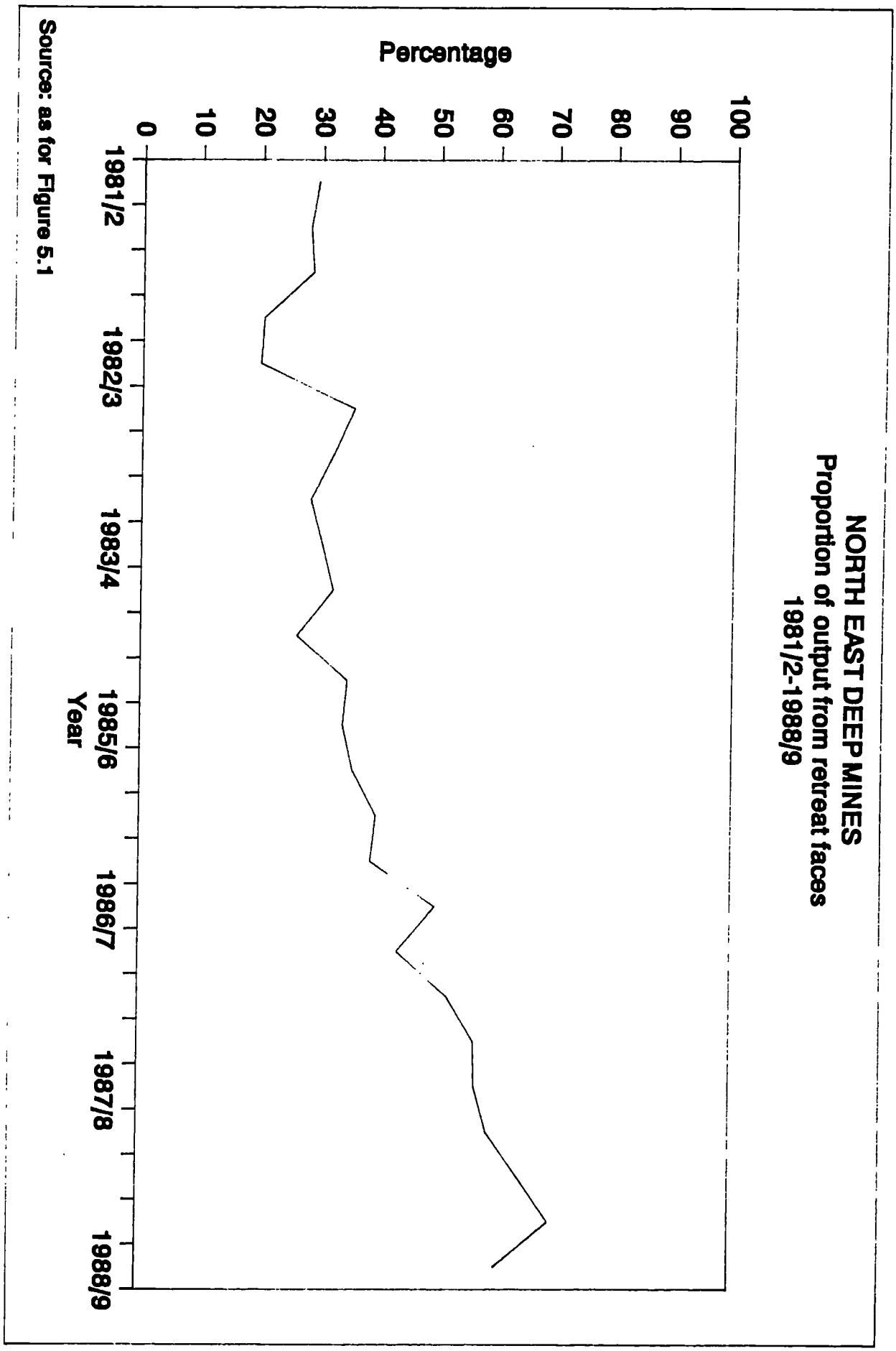

NORTH EAST DEEP MINES
Average daily output per face
1981/2-1988/9
saleable tonnes
1250
1000
750
500
250
0
1981/2
1982/3
1983/4
1984/5
1985/6
1986/7
1987/8
1988/9
Year
Source: calculated from British Coal data, privately supplied

Figure 5.2



Source: as for Figure 5.1

Figure 5.3

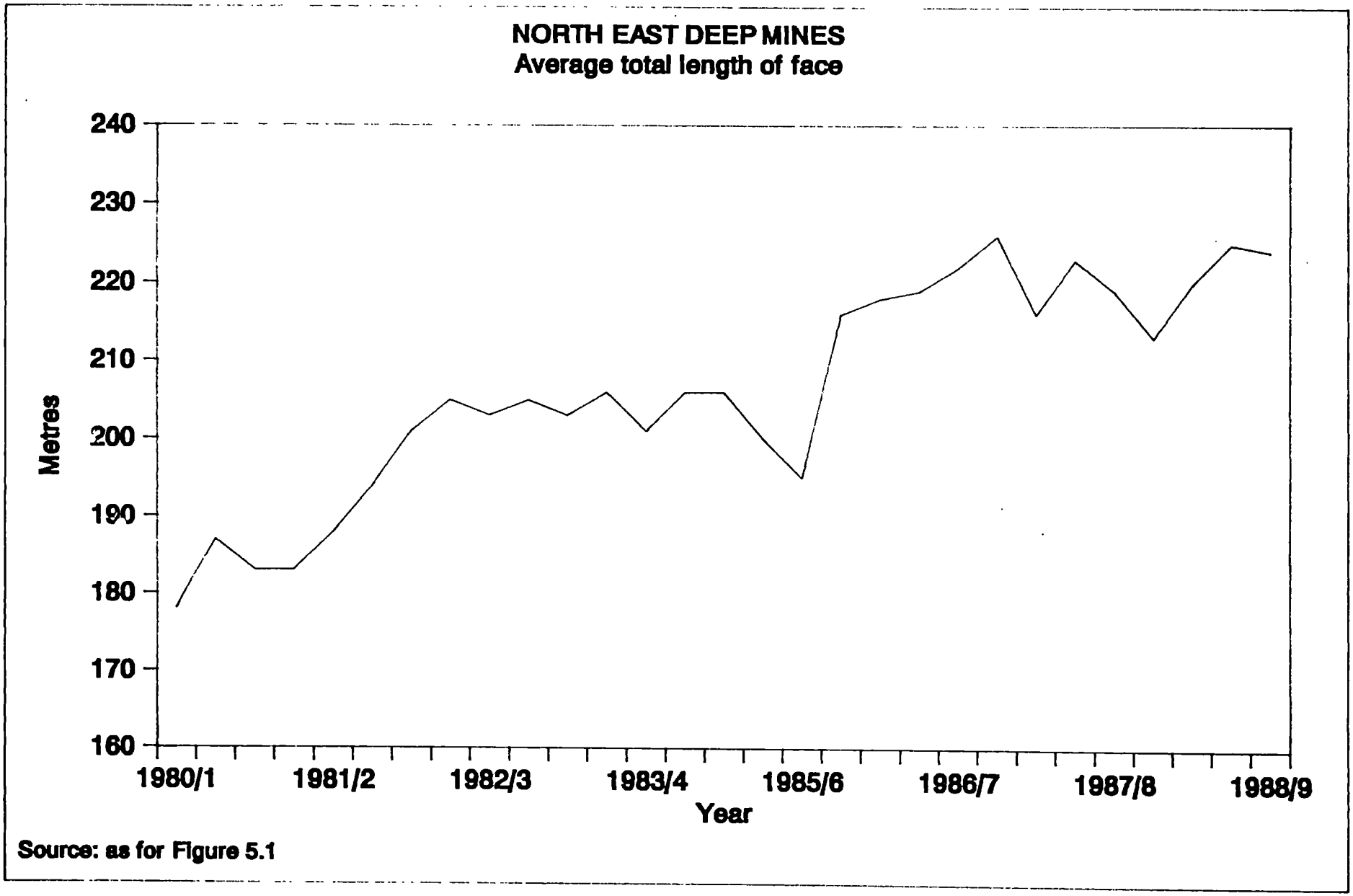


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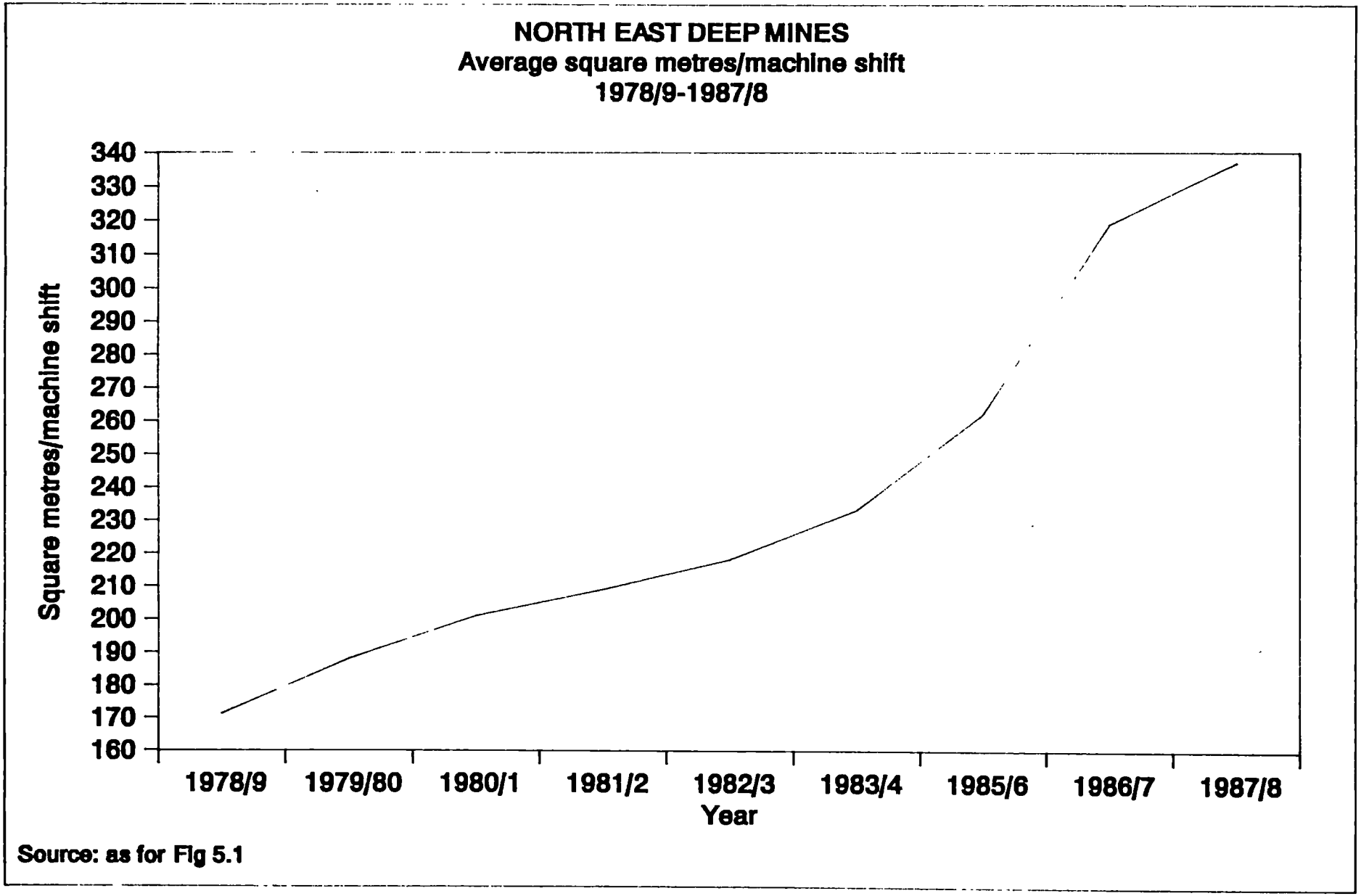
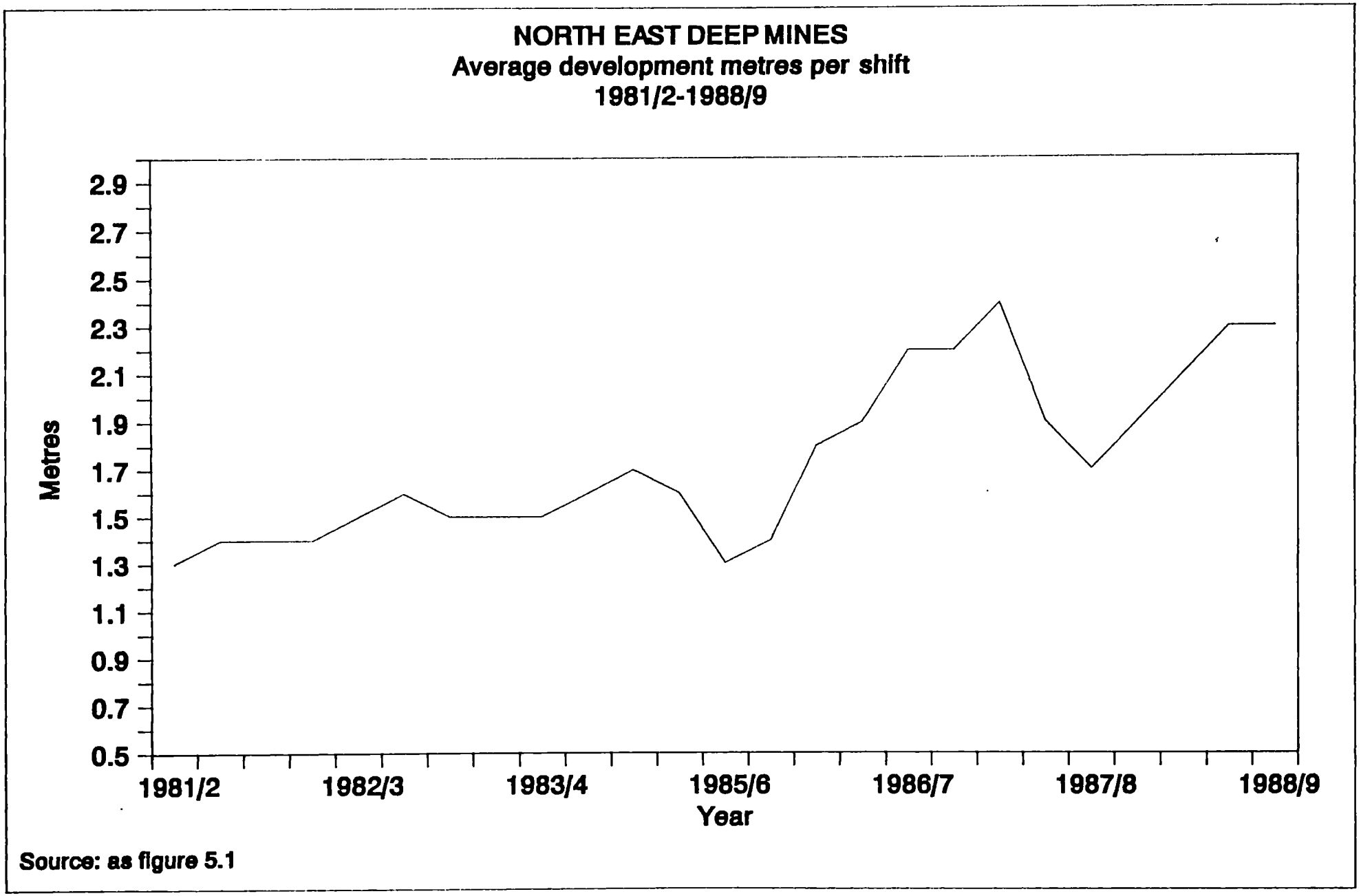
Figure 5.4



Source: as for Fig 5.1

Figure 5.5



Source: as figure 5.1

Figure 5.6

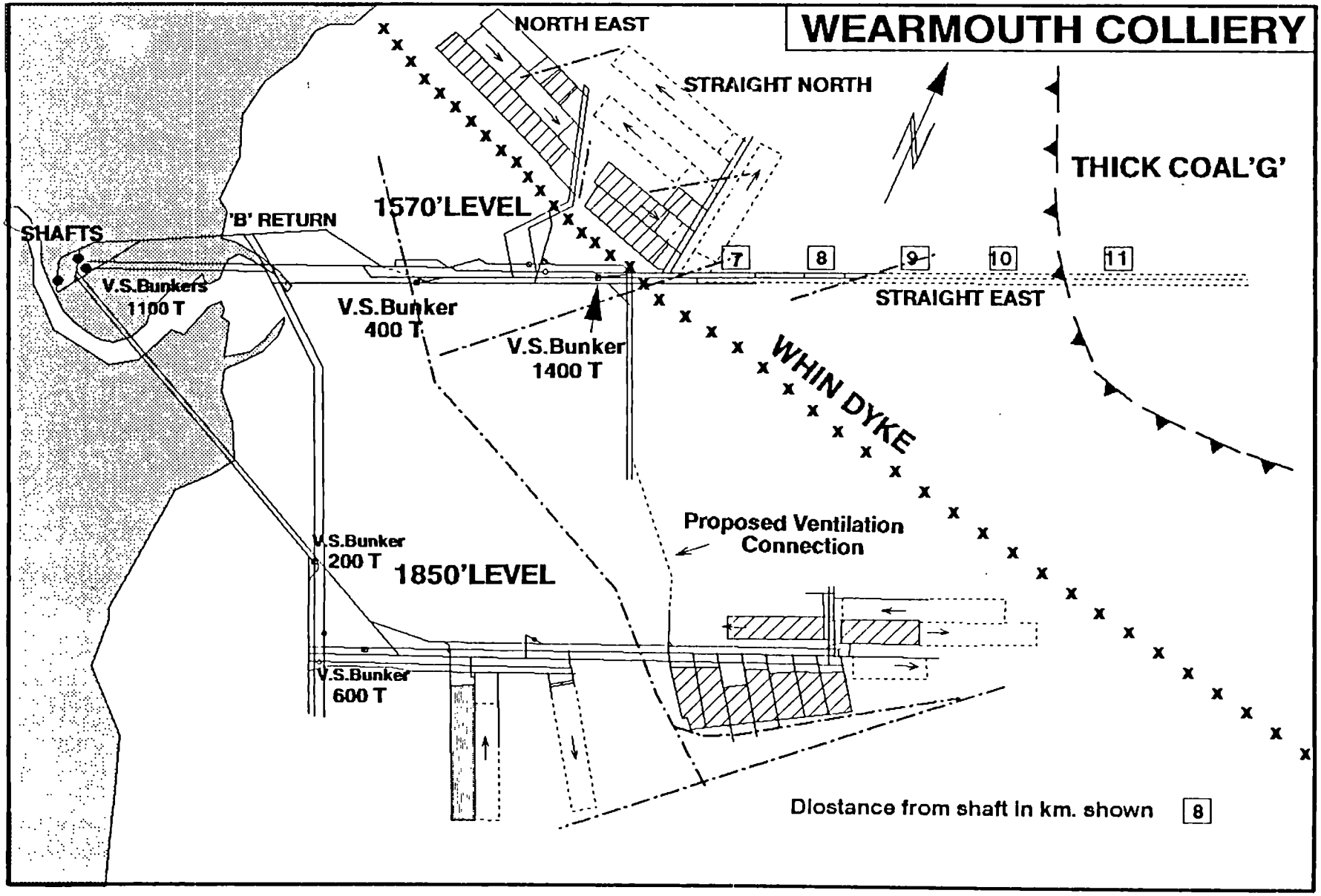

WEARMOUTH COLLIERY
NORTH EAST
STRAIGHT NORTH
THICK COAL'G'
1570'LEVEL
'B' RETURN
SHAFTS
7
8
9
10
11
V.S.Bunkers
1100 T
V.S.Bunker
400 T
V.S.Bunker
1400 T
STRAIGHT EAST
WHIN DYKE
Proposed Ventilation
Connection
V.S.Bunker
200 T
1850'LEVEL
V.S.Bunker
600 T
Distance from shaft in km. shown
8

Figure 5.7
DAWDON COLLIERY
Number and proportions of men on books

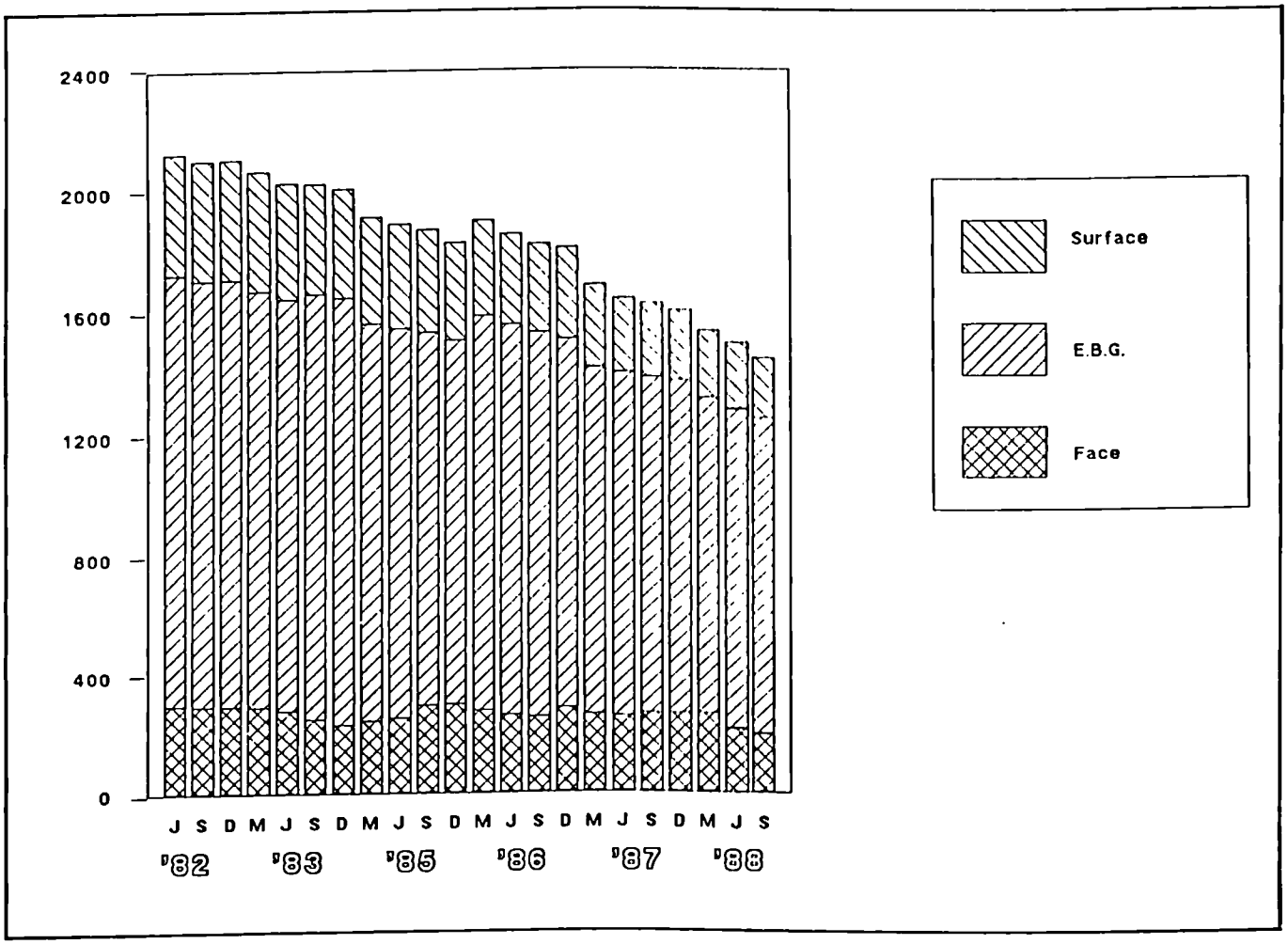


Figure 5.8

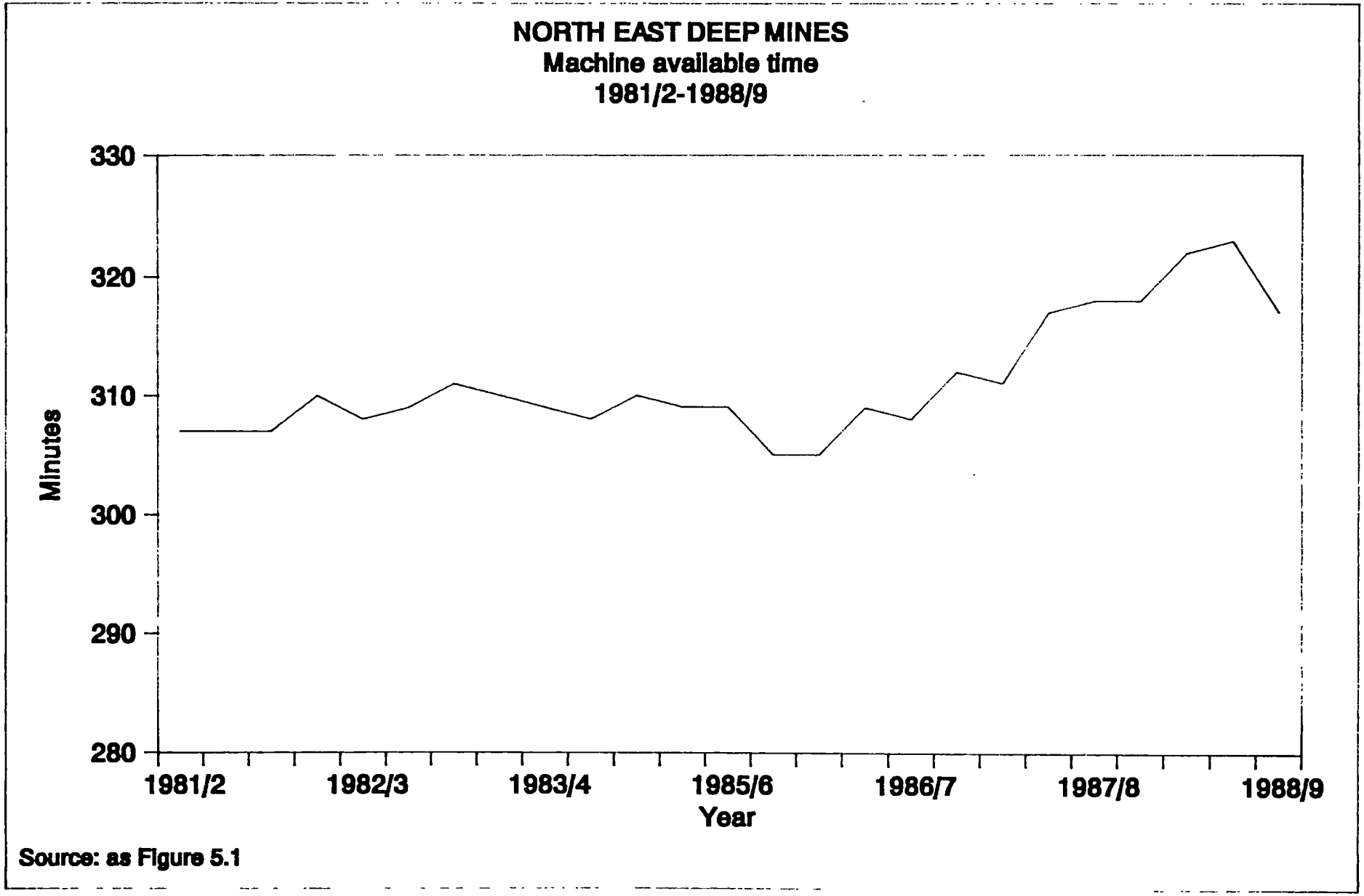
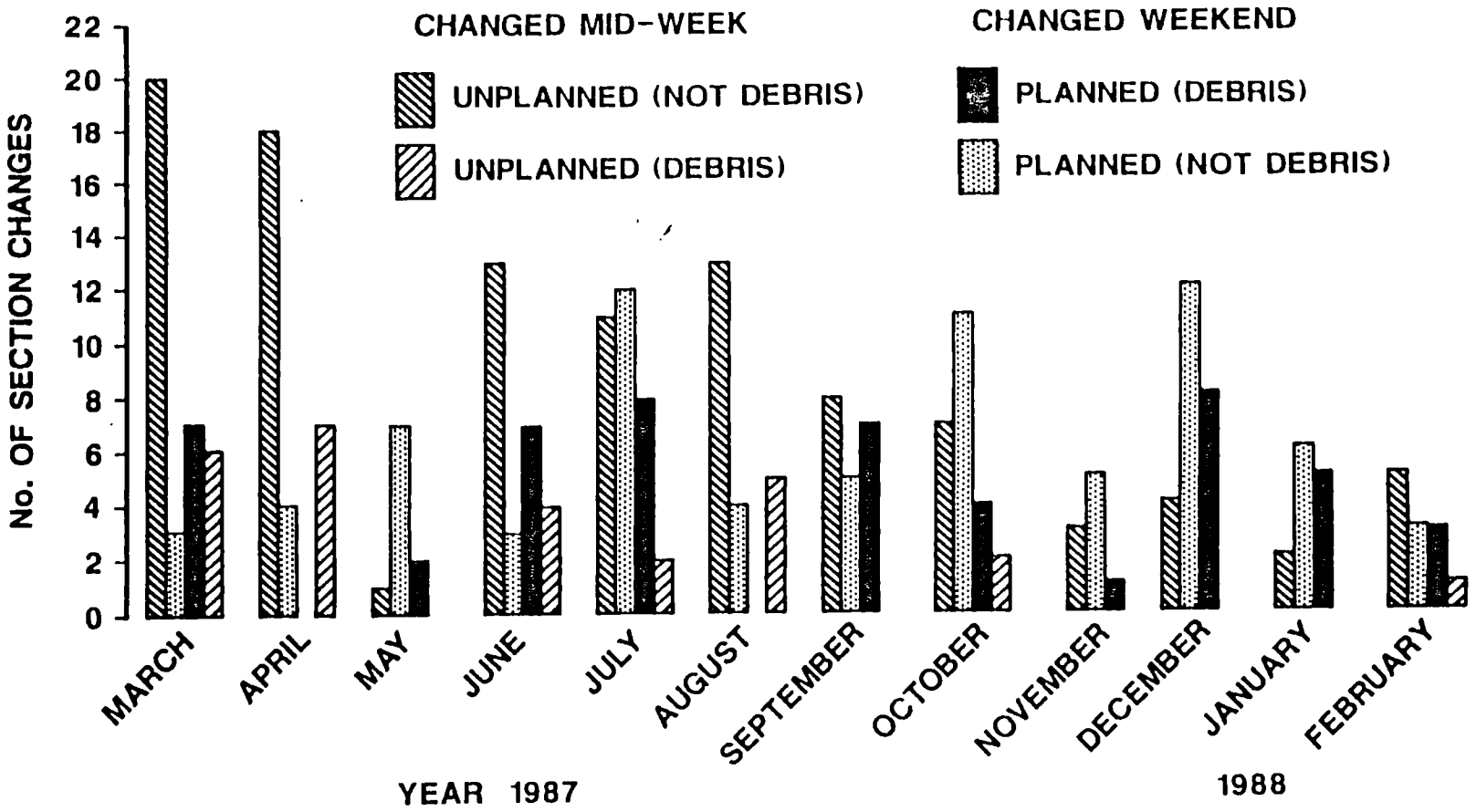

NORTH EAST DEEP MINES
Machine available time
1981/2-1988/9
330
320
310
300
290
280
Minutes
1981/2
1982/3
1983/4
1985/6
1986/7
1987/8
1988/9
Year
Source: as Figure 5.1

Figure 5.9



Shear section changes 1987/88, North East Area, British Coal.

Figure 5.10

DAWDON COLLIERY

CO3 Face: Shearer units changed before and after the introduction of RCM

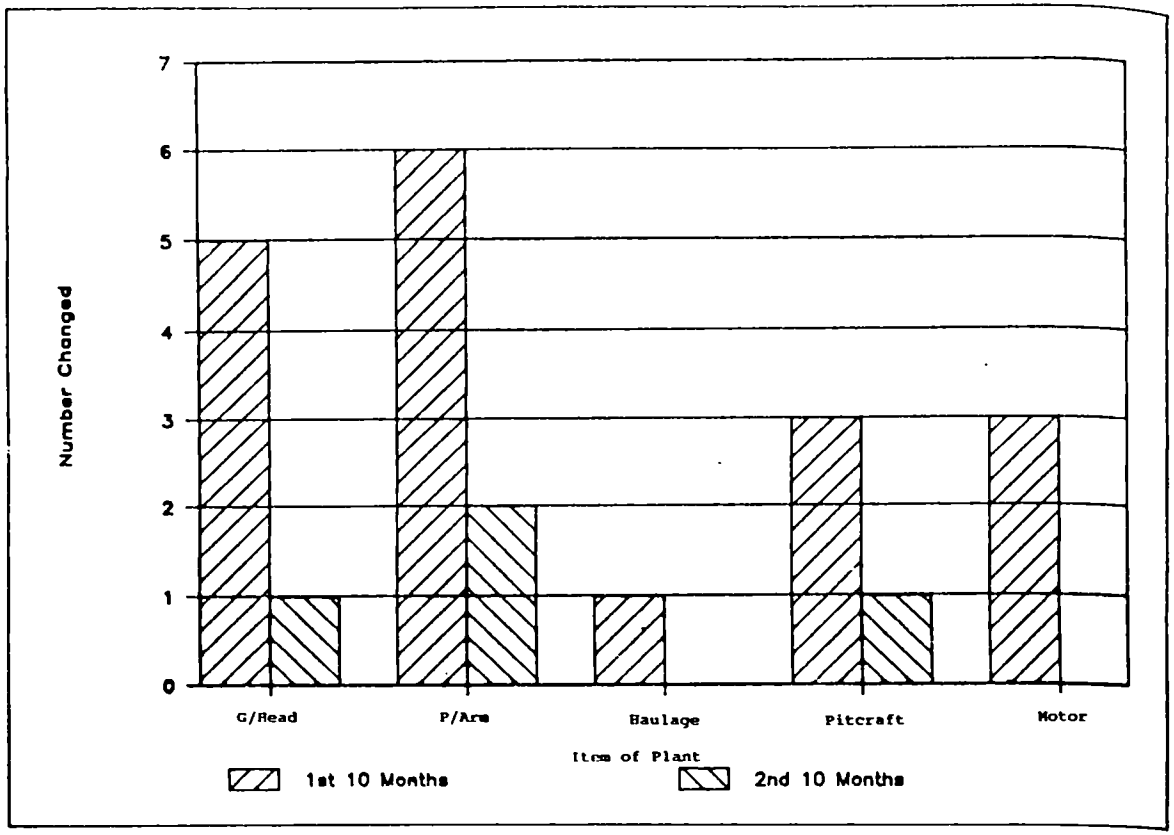
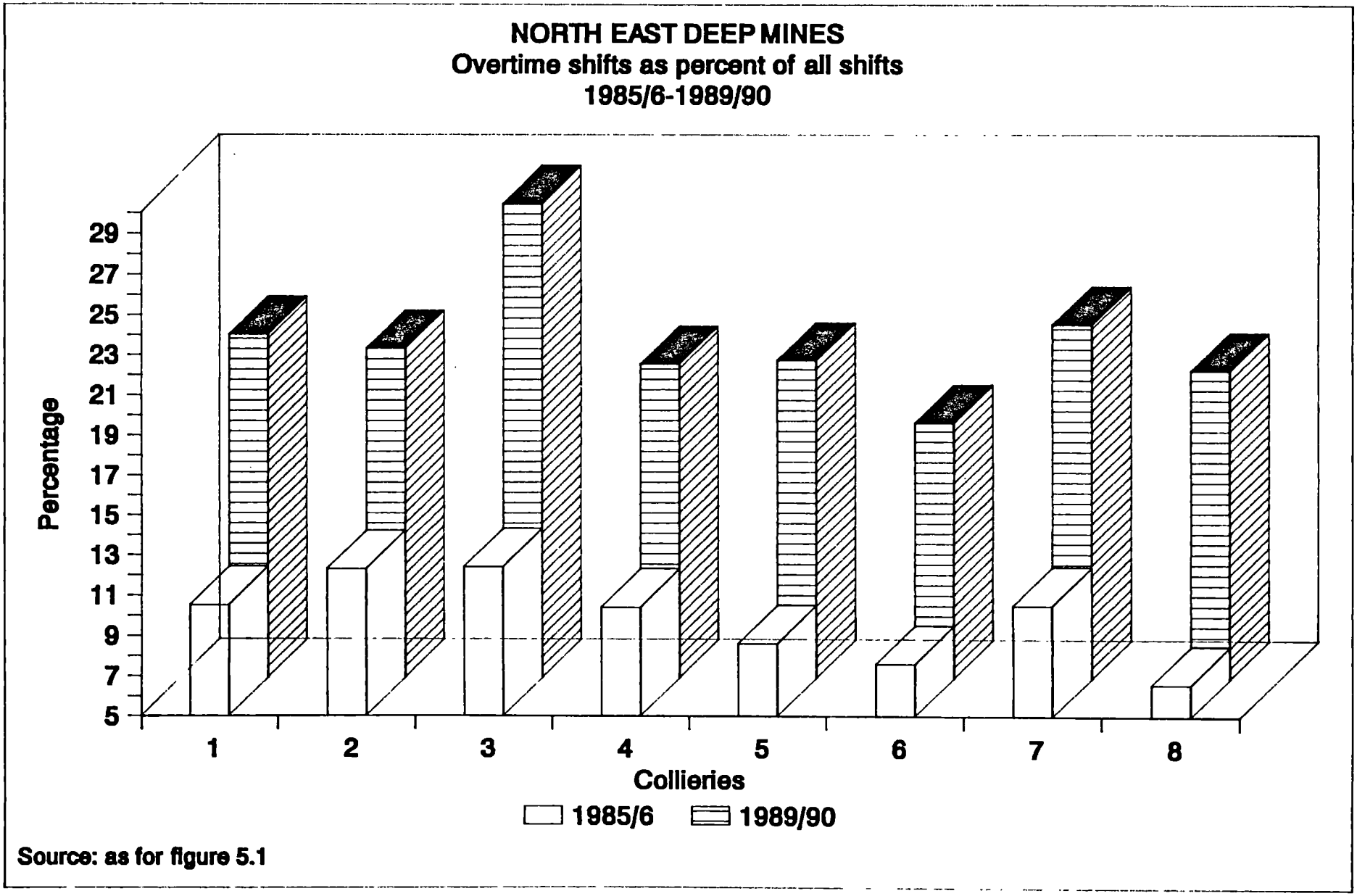


Figure 5.11

Key:
1. Area
2. Dawdon
3. Easington
4. Ellington
5. Murton
6. Vane Tempest
7. Wearmouth
8. Westoe



Source: as for figure 5.1

CHAPTER SIX

SELBY: A POST FORDIST COALMINE?

1 INTRODUCTION

The development of British Coal's Selby complex provides a compelling contrast with the pattern of restructuring in the North East coalfield. While restructuring in the North East was based on limited forms of technical change, Selby's exploitation was proposed under the Plan for Coal (PFC) and has been a symbol since the end of the 1970s of the coal industry's shift from being a labour intensive industry to a capital intensive one. From the outset engineers held that the use of microelectronic technologies would be central to Selby's production system. It remains, to date, BC's most modern capacity and is described as the most modern deep mine in Europe. While the process of technical change which was undertaken from the end of the 1970s was designed to have wide applicability, the technical trajectory was to have fullest expression at Selby. The first aim of this chapter, therefore, is to outline the nature of the production system around which Selby was developed. I argue that 'the Selby concept' was a conscious emulation of the 'continuous flow' production model to which the industry had been aspiring over several decades.

'The Selby concept' was for a new level of capital intensity and production integration, making maximum use of advanced, automated technologies. Moreover, throughout its development the suggestion was

made that this new production system would require a new type of labour force. In addition to the use of advanced technologies, from the outset, there were regular (if somewhat vague) suggestions by the NCB that there would be a new relationship between management and workforce. Indeed, the early literature on Selby had a 'post-Fordist' flavour to it. On the other hand, the work of the Bradford Group (examined in Chapter Four) predicted that the type of technology around which Selby was being designed was based on extending management control over the miners' traditional workplace autonomy and on eroding skills. This chapter is concerned centrally with examining the nature of work at Selby.

The early planners of Selby, it appears, were filled with optimism about the potential of the complex and the technology upon which it would be based. Although much publicity was given to successive production records at the complex, by the late 1980s, it was possible to note a defensive tone in the pronouncements of BC concerning Selby. Fieldwork in the complex carried out in 1989/90 revealed that management's disappointment with Selby's performance was an open secret. Indeed, after the completion of this case study, a spasm of publicity was generated around this issue. This chapter helps to illuminate the technical and human causes of Selby's underperformance. The chapter begins by examining the origins of the Selby complex in the provisions of the PFC and then outlines of the distinctive 'Selby concept' and how it aspired to the conditions of a regularised, flow production. Following this the chapter shows how the implementation of the Selby concept has proved more difficult than was imagined by NCB

planners for technical, and for social reasons. From a technical viewpoint, the geological structure of the Selby coalfield proved more complex than had been imagined, and this limited the effectiveness of the factory-type concept. From a social viewpoint, the attempt to recast the relationship between labour and capital was frustrated by the traditional perception of bargaining issues held by the union combined with the onset of the 1984/5 dispute.

The evidence presented in this chapter suggests that the NCB made tentative attempts to alter its relationship to new mining workforce in the early days of the complex. However, it appears the attempt to recast the relationship between management and labour at Selby remained limited and vague and foundered on the events surrounding the 1984/5 miners' strike. Following the strike management followed a contradictory industrial relations strategy of arbitrary assertion of authority and attempts to elicit the cooperation of the workforce in the struggle for improved productivity. This pattern reflected, in large measure, the ascendancy of the hardline faction within the management, which meant that the relationship between capital and labour was one which would tend to be based on its subordination, rather than active participation. In practice, however, the former tended to dominate rather than eradicate the latter. The chapter suggests that even attempts to develop a production facility around advanced forms of automation were influenced by the wider patterns of class conflict characteristic of British industry in the 1980s.

2. THE ORIGINS OF THE SELBY COMPLEX

The origins of the Selby complex lay in provisions contained within the Plan for Coal, 1974 (PFC). The PFC itself had been stimulated by emerging instability in the energy market which resulted in the oil price rises of late 1973. Simultaneously, there was in NCB circles a growing concern at the prevailing low levels of investment. The PFC predicted a relatively modest increase in the market for coal by the mid 1980s to between 120mt and 150mt by 1985, with a mid-point guide of 135mt. To meet this market, capacity was to be modernised. The modernisation of capacity was to consist of the loss of 3-4 million tons of capacity per annum, through exhaustion, and the creation of up to 42mt of new capacity by 1985. This new capacity was to consist of 9mt resulting from access to reserves at existing collieries which would otherwise close, 13mt from major schemes at existing collieries, and 20mt from new collieries, of which 10mt was to come from the development of a new coalfield at Selby in North Yorkshire.

Chapter Four described how the collapse of demand for energy after 1979 threw the PFC into crisis and how the NCB began a policy of rigorous interpretation of the clauses on closure which caused increasing tension between the NCB and the NUM in the 1980s and which underlay the 1984/85 miners' strike. However, while the politics of the coal industry was dominated throughout the 1980s by the closure issue, equally important was the process of modernisation which continued during this period.

Although the development of new mines included the opening of new drifts at Royston and Kinsley in South Yorkshire and Betws in South Wales, the centrepiece of the new mine programme was the Selby prospect. The existence of a large coal deposit between York and Selby had been established in the 1960s. However, its discovery came during a period of dramatic contraction in the industry. The changing energy situation at the beginning of the 1970s prompted a reassessment of the potential of the area and led the NCB to believe that the area contained abundant, clean coal (Ashworth, 1986: 387). At the same time, it was recognised that the topology of the area posed some potential mining difficulties difficulties. The Vale of York is a flat, low lying area with a complex natural drainage system disturbance of which had to be avoided. It was planned to mine from the Barnsley seam, the richest of five seams, which together contain 2,000mt of coal. The Barnsley seam itself contains 600mt of which it is planned to extract only half to avoid subsidence. For instance, large pillars of coal are to be left under parts of Selby town (including the Abbey) and the village of Cawood (near the confluence of the rivers Wharfe and Ouse) to prevent subsidence leading to flooding (Mining Magazine, June 1983; Ashworth, 1986). The output of the complex supplies nearby power stations. First estimates put the production potential of the area at 5 mtpa. Subsequently, a figure of 13mtpa was included in the first version of the PFC but this was revised down to 10mtpa in summer 1974, representing the fastest rate of exploitation that was thought to be manageable (Ashworth, 1986: 387).

A public enquiry into the NCB's proposals was held in spring 1975 and planning permission granted in April 1976. Selby was the largest single capital project ever undertaken by the British coal industry and was planned as the largest deep mining complex in the world. It was expected to employ 3,000-4,000 workers and to produce 10.2mt of coal when full production was reached which was scheduled for 1987-8. Originally it was anticipated that revenue production would begin at Wistow in 1981-2, but regular production did not get underway until July 1983. It was anticipated that increased production at Selby would compensate for the rundown of the West Yorkshire coalfield and that labour would be recruited from there to operate Selby. In February 1978 the cost of Selby was estimated at £552m (at August 1977 prices). With the effects of inflation and design modifications the cost had risen to a little over £1bn, including interest, by March 1982 (at current prices) (Ashworth, 1986). By October 1986 the final cost had escalated to an estimated £1.36bn.

For a variety of reasons a five mine complex (with each mine producing 2mtpa) with coal clearance through parallel drifts was proposed - the so-called 'Selby concept' (see section 3 below). The Selby project was inaugurated in October 1976 at Wistow, with shaft sinking beginning there in August 1977. Drift drivages began at Gascoigne Wood in March 1978. Between 1978 and 1980 shaft sinking began at the other mines in the complex. Wistow mine began production in June 1983 but shortly afterwards it was interrupted by an inflow of water. Production was only recommenced in June 1985 following the adoption of a radically revised mining practice (see section 4 below). In January

1988 Riccall, Stillingfeet and Whitemoor began production, with the remaining mine North Selby due to begin production in 1991.

3. 'THE SELBY CONCEPT'

It was planned from the outset to develop the Selby complex by means of 'a highly integrated, large-scale mining complex using the latest technology' (Ashworth, 1986: 387). Five collieries - Wistow, Riccall, Stillingfleet, Whitemoor and North Selby - were to be sunk and linked underground. The output from these collieries would be conveyed via two drifts to the surface at Gascoigne Wood, near Monk Fryston where, fortuitously, there was a large area of unused railway sidings which could be equipped for rapid loading (see Figure 6.1). Berkovitz quotes a contemporary NCB document which stated that 'maximum use [was] to be made of automation and remote control techniques, including the use of computers programmed to react to changes in coal flow' (1977: 207)[1].

Borehole data indicated a relative absence of faulting leading to a belief that the coal was unusually clean with an ash content well below the

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[1]From the outset Selby was conceived in terms of the latest levels of automation. Wilfrid Miron in his plan, largely in response to labour control considerations, had asked: 'Is it possible to set out the Selby mine(s) on ROLF or its up-to-date like?' (see Chapter Four). William Forrest, Selby's first chief planner, argued: 'In order to keep manpower to a minimum, many operations would be designed for automatic or centralized control. These systems are much more likely to be successful if they are designed to be manless from the outset. With the techniques available now it does not seem unreasonable that one man per shift, assisted by patrol men, could supervize all coal handling from the face to the coal preparation plant' (Forrest, 1974: 223; also Rees, 1976a&b).

18-20 per cent acceptable to modern power stations. It was believed, therefore, that run of mine coal could be transported directly from the drift outlets to the power stations without the need for washing facilities. This factor was important because it allowed the NCB to allay local fears about the creation of spoil heaps. Rapid loading at the drift head would allow a constant stream of 'merry-go-round' trains to transport the output to Eggborough, Drax and Ferrybridge power stations which are visible on the horizon from Gascoigne Wood.

A further factor which influenced the development of the Selby concept was the NCB's belief that a mine complex based on drift access would best allow the application of advanced technology[2]. According to a British Coal document:

> Drift access to suitable coal reserves had become increasingly popular in Britain during the sixties and early seventies, coinciding with the development of high-capacity conveyor belt systems. The continuous flow of coal-carrying conveyors is more efficient than the stop-go method involved in winding coal up a shaft. Total conveying also lends itself more readily to remote monitoring and control from the surface. At Selby, the well-proven British Coal-designed methods of controlling the transportation of coal by conveyors, will be brought to new levels of sophistication and efficiency, making maximum use of the micro-chip and computer.

Drift access was especially appropriate at Selby because of the natural incline in the seam and because at the western edge of the proposed mining area engineers believed they had found good quality coal nearer the surface (Pollard, 1976; also Rees, 1976a&b). The production

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[2]Had Selby been developed on the basis of five shaft mines the labour requirements would have been much higher (over 10,000 men) and the application of advanced microelectronics more limited. The 'Selby Concept', therefore, was a particularly attractive one.

process was to be integrated to a greater degree by rapidloading. Peak output is delivered from the drift tunnels at rates of 2,500tph. Once at the surface, the coal is carried into a covered stockyard and retaining area. The covered stockyard - the largest single span structure in Europe - can hold 43,000t, equivalent to one day's output of the complex and is designed to match the output of the mines with the availability of trains. A series of boom stackers and barrel reclaimers feeds the coal into bunkers adjacent to and over the railway sidings. In theory, permanently coupled British Rail liner trains are loaded with 1,000t of coal in eleven minutes. At peak output loaded trains are scheduled to leave Gascoigne Wood for the power stations every half hour, day and night, five days a week.

It was advocated from the earliest that regulation of this integrated mine complex be achieved by the widespread application of computer technology (Forrest, 1974; Rees, 1976a&b). Each of the shaft mines has its own MINOS installation operated from a surface control room. All five mine systems are linked to the master control at Gascoigne Wood which is 'able to interrogate the systems at any of the mines and, when necessary, carry out remote operation of certain functions throughout the whole coalfield' (Mining Magazine, June 1983).

From an early stage it was decided to mine Selby using exclusively retreat methods and heavy duty equipment. The first operational face was A1s at Wistow which was opened out in 1983. A1s at 138m in length, was relatively short, reflecting subsidence considerations. The face equipment comprised an AS 500 DERDS; 80 Dowty 4 x 450t

hydraulic roof supports; AFC, stageloader and other equipment and had an estimated value of £3.5m (at current prices). The estimated face output was 2,000t/day. At this stage it was planned to operate the complex on the basis of 20 such faces (Mining Magazine, June 1983). By 1987, however, revised specifications for face equipment were issued. Coal faces at Selby were to operate with higher powered shearers (of the order of 500hp), using 4 x 450/650t chocks giving rise to an estimated average daily output per face of 5,000t (British Coal, 1988). Faces at Riccall now operate with 700t chocks (Stott, 1988). The estimated value of face equipment had also risen. Stott (1988) reports the cost of equipping C1s and D2s at Riccall as £9m. Consequent upon this growth in face output potentials, it was decided to concentrate production on 10 faces (see Table 6.1). An indicator of the relative capital intensity of the complex is given in Table 6.2.

In addition faces are equipped as standard with a high degree of microelectronic technology. All shield supports are fitted with transducers which allow remote operation of the chocks in batches. Push buttons replace the conventional hydraulic valves for the various chock operations. All shearers are equipped with auto-steering and with self-diagnostic condition monitoring equipment. Finally, the whole face is subject to the wider electronic monitoring associated with MINOS and CIS-VAX real time analysis systems.

Coal from the faces is cleared through the main parallel conveying entries to Gascoigne Wood. These are called the 'spine tunnels' and lie below the Barnsley seam roadways (see Figure 6.1). Originally the

spine roads were to be driven a distance of 15km and to be connected separately to each of the producing mines. However, a roof fall in the south spine buried the huge Robbins circular tunnelling machine, delaying progress while it was recovered. A new system of coal clearance was designed which was based on connecting North Selby and Stillingfleet and Whitemoor and Riccall (illustrated in Figure 6.1). This had the effect of reducing the length of the spine to 12km and, to some degree, complicating the coal clearance process. According to British Coal, the spine tunnel conveyors 'are pushing bulk conveying technology in coal mines to new limits'. These high capacity conveyors are designed to operate a minimum 20 hours per day with an average load of 2,500tph. Both are single flight conveyors and as such have no transfer points, thus allowing considerable savings in labour[3].

The Selby Concept represented the fullest expression of the trajectory of technical change established in the 1970s. While this process of

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[3]The conveyors are designed to accept the whole output from the producing mines, but the delivery rate to the spine conveyors from the producing mines will obviously fluctuate. To cope with these production fluctuations and still maintain the necessary consistent flow of coal to the surface, a series of buffers was planned. The conveyors themselves are driven by two 5050kw DC motors located at the surface - itself a departure from prevailing mining practice where conveyors are driven by a series of smaller underground motors. The discharge rate from each bunker must be carefully controlled to prevent overload on the drives or spillage on the spine conveyors, since the coal will be loaded onto the conveyor at different points along its length. The dipping gradient of the spines means that the loading points are located at varying depths below the surface. Therefore, the energy needed to raise coal from a particular location depends on where the coal is discharged on the spine. A computer system was installed at Gascoigne Wood to manage the coal flow system and to calculate the amount of energy required to raise the coal (Whitworth, 1989; Tuke, 1989).

technical change was designed to have wide application, the significance of Selby was that the whole mine complex was designed around the new technologies and around the principles of flow production. At the outset of the fieldwork on which this chapter is based, wide publicity had been given to both the 'Selby Concept' and the recordbreaking production performances at the complex[4]. However, the complex was beset by geological/technical and labour relations problems from the outset, and BC's disappointment with the performance of the mine was an open secret in Yorkshire.

4. PRODUCTION PERFORMANCE AND TECHNICAL PROBLEMS

Selby has been witness both to production records and to unanticipated setbacks. An examination of much of the engineering and other literature on the development of Selby in the late 1980s reveals a more defensive tone (eg Siddall, 1989) which is in contrast to that of the earlier periods (see section three). The geological and technical problems were exacerbated by labour relations problems which are the subject of the next section. The root of the problems facing the complex appeared to reflect an apparent over-confidence about the geological structure of the coalfield during the period of its earliest development. The fact that the geological structure of the coalfield is a

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[4]The wide publicity given to certain record breaking performances was reflected in the view that Selby was in danger of overproducing and this would cause pit closures elsewhere. This view was advanced by Prior and McCloskey (1988) and Whitworth (1989). For a similar interpretation see 'Selby pits too successful?', Selby Times, 25.4.88).

good deal more complicated than had hitherto been believed limited the effectiveness of 'the Selby concept'.[5]

Geological limits to the 'Selby concept'

Predictions about the geology of Selby were based on over 70 boreholes and 150km of surface seismic studies conducted there mainly during the 1970s. These boreholes identified a dipping seam of 2-3m in depth and suggested a relative absence of faulting. It was on this evidence that claims for a low ash content were made. Once mining began at Selby a clearer picture of the geological structure began to emerge. This revealed that the major tectonic structure accorded with predictions but many unexpected problems arose which were caused by minor tectonic and sedimentary structures too small to be identified from boreholes or surface seismic surveys. All the Selby mines have been affected to some extent by these zones of minor faulting, but major problems have included: the abandonment of several faces at Wistow; major stoppages of the Robbins tunneller in the south spine tunnel; excessive

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[5]Williams et al had the foresight to recognise that the Selby Concept was a risky one: 'The geological risks are obvious when a super-pit like Selby will try to win 10 million tonnes of coal per annum from one set of coal measures. Quite apart from the problem of having all the enterprise's (productive) eggs in one (geological basket), there are other risks. Super-pits tie the enterprise to one local customer. All Selby's coal, for example, goes on merry-go-round trains to local power stations. Super-pits also use an unproven capital-intensive technology which is vulnerable to disruption. This is certainly the case at Selby where, when the pit is fully operational, continuous conveyors 30 kilometres long will be required to take the coal from the furthest of the five collieries to the railhead' (1986: 185). This important insight is developed in the following sections.

deformation in main drivages at Whitemoor; and, a major roof fall in a transport road at North Selby. In addition, sandstone intrusions have caused local partial washouts of the seam, notably at Riccall (Tuke, 1989; Siddall, 1989).

The first major geological problems to be encountered at Selby included the problems of water inrushes at Wistow and roadway deformation in the main spine tunnels, both of which had serious implications for the development of the complex. At Wistow the first two longwall faces A1s and A2s were lost due to flooding. The workings in the north-west district of the mine approach the overlying water-bearing strata and longwalls of only 140m were planned here. However, even these proved too ambitious and had to be abandoned. In their place a system of `single-entry' faces was developed, initially 45m in length, designed to reduce pressure on the face. Later these faces were transformed into so-called 'microfaces' - only 15m long. These faces have been presented as an engineering success by British Coal and have saved Wistow north-west side from complete abandonment. Performances from single-entries reached 25,000t per week and more than 2.3mt had been extracted from `A' block using this method by 1989. However, the costs of developing such faces are high and the 'microfaces' are reported to have a life of only five weeks or so (Siddall, 1989). The NUM and others expressed reservations about single-entry faces because they lack adequate ventilation and a second means of egress. Indeed miners at the complex reported intense heat in some single-entries and some described their personal anxieties at working up

to 40m inbye without means of escape. Nevertheless they have become part of normal working practice at the complex.

Problems also affected the drivage of the main south spine tunnel. The completion of this tunnel was critical to the future of the complex because production could not begin from all of the mines until connections had been made into the tunnel and onto the coal clearance system. The drivage of the tunnel was halted in 1983 following a roof fall which buried the Robbins tunnelling machine. A similar problem occurred in 1987 when the tunnel was at the 12.164km mark and this was when the decision was taken not to continue the drivage to the 15km mark but instead to connect North Selby to the main clearance system via Stillingfleet. The spine tunnels continue to suffer from intense geological pressures which have led to serious deformations of the roadway profile. Large numbers of men have had to be engaged in virtually continuous backripping operations while strenuous efforts were made to overcome these geological problems (eg. Tuke, 1989). Coal clearance problems were compounded by problems with the South spine conveyor drive which had to be replaced (Siddall, 1989) and problems occurred with the computer control system at Gascoigne Wood (Buck, 1989). In the latter case, failures in the microelectronics led to substantial machine downtimes, although these problems were seemingly overcome following the redesign of equipment (see Figure 6.2).

These major geological difficulties were reproduced many times on a smaller scale. Deformation of gates on retreat faces caused problems. Despite its evident advantages, retreat mining has an Achilles heel in

the potential problems associated with the operation of the T junction at the main gate end where permanent supports set in the gate have to be removed to allow the goaf to collapse. Where geological pressures are great, gates experience severe crushing. Mining engineers at Selby discovered that if roadways are driven parallel to the line of maximum stress which is inherent in the coalfield, roadways are much more likely to maintain their original profile. Where possible this is done, irrespective of traditional concerns such as direction of cleat (Moore, 1990), but places further limits on production performance.

The direction of drivage and faulting patterns play a significant part in in the speed of drivage as well as their ultimate stability. In total retreat mining, as in Selby, production is critically linked to drivage rates in order to ensure minimum disruption between the operation of coalfaces and continuous utilisation of assets. Management stated regularly that inadequate drivage rates represents one the main production problems at Selby. In the period 1988-90 20 per cent of drivages were abandoned at Selby. This resulted in situations where only two faces have been in production in the complex (instead of 7-8). The problem of having capacity on-line following face exhaustion is exacerbated at Selby when face performances are high. Selby is required to develop roadways at up to 3.5 times the rate at which roads are being exhausted by retreat mining. Despite the application of the most advanced roadheaders and continuous miners available, Selby consistently struggled to achieve necessary rates of advance (in excess of 100m per week).

Selby management committed themselves publicly to increasing the amount of drivage from 50,000m to 80,000m in 1990/91. This was to be achieved by the purchase of additional heavy duty face equipment to eliminate installation time lags and the more extensive use of roofbolting (Riccall Review, May, 1990). The use of total roofbolting, it is believed, will reduce the time absorbed in setting conventional steel supports. Total bolting also gives rise to considerable cost savings. A rapid improvement in performance here is seen as necessary to bring isolated record breaking performances closer to the norm.

Management found encouragement in the fact that the main drivage at North Selby reached 1,600m without encountering major faulting, allowing the development of seven major faces either side of the drivage (International Coal Report, 23.3.90). However, such optimism needs to be tempered by the knowledge that at North Selby faces are to be operated with three gates to overcome ventilation problems (Siddall, 1989; Tuke, 1989). The development problems suggested by this are huge and given the depth of workings at North Selby geological pressures are likely to be great.

The quality problem

Another major problem facing Selby concerned the quality of the product being mined. Selby was developed on the basis of a highly optimistic assessment of the cleanliness of the coal (see section 2 above) which was derived from surface boreholes. Excluding the area to the south where the seam splits into the Warren House and the Low

Barnsley, the seam was believed to have no significant dirt bands and to have an ash content of 4-7 per cent. This view of the nature of reserves was held until very recently (eg. Siddall, 1988). The results of surface seismic exploration then formed the basis for planning the mine layout so that a product with an ash content of less than 18 per cent could be produced for the CEGB without the need for surface coal preparation facilities. However, output from the first four mines during the first six months of 1988 resulted in a run of mine with an average ash content of 23.4 per cent, sometimes peaking at over 30 per cent. This reflects the geological disturbance and zones of minor faulting mentioned above.

High dirt content originated, firstly, from development operations. This included the extension of the north spine and the backrips in the south spine described above and permanent infrastructural work which produces a run of mine with an ash content of over 50 per cent. A second source of ash is the coal getting operations themselves, including in-seam drivages, and through cutting the roof and floor and dinting operations.

The dirt problem has been tackled at the surface through the building of a rail unloading facility in order to bring in coal to sweeten the Selby product. At one stage this included an estimated 50,000t per month from North East collieries[6]. In addition, a gamma ray ash

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[6]Miners at Wearmouth joked that they had become honorary members of the Selby complex.

monitor has been installed above the main conveyor at Gascoigne Wood. This enables the dirty material to be identified and stocked separately for further treatment. The dirty run of mine is usually contained in oversize material and screens have been installed to separate this. Finally, four barrel washers have been installed in the covered stockyard which can handle 20,000t per week. This situation has completely transformed the surface operation from the original conception of a despatch point for untreated run of mine. One problem faced by BC has been that of disposing of large quantities of dirt from Gascoigne Wood. This has tended to be transported by lorry to disused mine shafts in other parts of Yorkshire - often in the face of opposition from local communities.

The dirt problem is also being tackled underground through the application of auto-steering. Autosteering is used to stop the shearer cutting into the floor and roof of the face. BC estimate that, at Selby, ten centimetres of dirt cut on the face increases the ash content by six per cent. With autosteering, a microprocessor incorporated into the shearer uses natural gamma rays from strata overlaying the coal to calculate the optimum position of the cutting drums, raising them or lowering them as required. All shearers at Selby are fitted with autosteering. Autosteering appears to have been introduced with variable success due to technical problems. While used relatively successfully on single-ended shearers, autosteering has been applied less successfully on double-ended shearers. This is said to reflect poor reliability and lack of robustness in the microelectronic

componentry. The issue of autosteering, in particular the impact on workers' skills, is addressed more fully in section 6.

Capital utilisation

Originally each mine at Selby was planned to have four faces in operation (with one spare) with each working two machine shifts per day. The improvement in performance levels associated with heavy duty technology, led BC to plan Selby in terms of one million tonne per year faces. As a result the mines are planned now to operate with two faces each working three machine shifts expected to produce two million tonnes per year each. The reduction in face shifts from eight a week to six a week has contributed towards a reduction in the manpower required for the complex. The original plan was for 4,000 men; but BC's final requirement is about 3,500[7].

However, a number of problems have been associated with the strategy of concentrating production on fewer faces. BC planned to operate a two face production system at each mine in the Selby complex. Equipment was purchased for two faces with the intention of transferring this between faces. BC believed that rates of extraction would be such that projected output levels would be attained from this arrangement. Under the arrangement one face is planned to work at full production (operated over three or four shifts) with the second

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[7]This excludes the regular use of contractors at the complex on a very large scale. This issue is addressed in section 7.

face either salvaging, installing or building up to full production, so that there would no gap in production. However, the inadequate development rates and geological problems at the face described above have exposed the vulnerability of this system. On occasions after 1987 when four of the fives mine were on stream there were occasionally no faces operating at some mines. Selby management, therefore, recently announced their intention to purchase additional face equipment to prevent potential time lags between faces completing operation and new capacity starting production. Mines will operate two faces with another as spare capacity. The exception is Whitemoor where geological problems mean that only one face will operate with another on standby (International Coal Report, 23.3.90). However, in early 1990 only two faces were operating in the complex with large amounts of expensive face equipment standing idle. Despite the different level of technology, then, the same production problems arise from 'over-concentrated' production which were identified in the North East[a].

Despite these problems, however, some faces have returned impressive productivity achievements. In 1988 Stillingfleet achieved an output from one face of 47,179t in one week, with a face OMS of 309.07t. In June 1988 it recorded a colliery overall OMS of 36.33t. In March 1989 the colliery established an output record of 72,471t. Riccall has achieved a weekly face output of 36,575t and a face OMS of 76.32t. Wistow has

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[a]When Selby Group management arranged for me to visit a face in July 1990, they were unable to confirm which pit I should visit until the day before because all the pits had serious production problems.

achieved a single entry face output of 26,928t in one week and in 1989 became the first European colliery to produce over 100,000t in a week. However, despite the wide publicity given to these 'bull' performances, and despite the extravagant claims made by some commentators for likely future performance levels at Selby, average performances in the period to 1990 were considerably lower. Stillingfleet's annual overall OMS was 12.8t in 1988/9 and Riccall's was 10.89t. The overall OMS for the complex over the same period was 8.14t[9].

The difficulties in sustaining recordbreaking performances are great. Machine running time data from the fieldwork period illustrates the scale of the problem. For instance, in 1989 it was reported that in the North Yorkshire Area (which then included Selby) conveyors were standing idle for an average of one fifth of machine available time, with delay analysis revealing that in some weeks cutting time has been reduced by a quarter as breakdown bottle-necks stopped coal being cleared from the face. In May 1989 the Area lost the equivalent of 33 machine shifts through belt delays and in June a further 42 shifts, costing an estimated £2.3m in lost revenue. Stoppages in the main spine tunnel belts at Selby accounted for a substantial part of this lost time (Colliery Guardian, October 1989). Figure 6.3 gives data for ROM

[9]Each of the pit production records, moreover, has been surrounded by allegations of 'cheating' from miners at other collieries in the complex It was alleged that coal stored in bunkers from the previous week was counted as coal produced during the record week at one mine. Also miners claimed that record production levels have been achieved at the expense of maintenance shifts which would be impossible to repeat on a regular basis.

production time losses for the following four months and illustrates that these problems continued. Moreover, despite the saturation of automated techniques and heavy duty face equipment at Selby, face stoppages are still a significant problem. Table 6.3 shows running times for main gate conveyors at selected Selby mines in 1989/90, illustrating that, on average, about one fifth of production time is lost time. It has been estimated that a reduction by half in the average number and duration of maingate stoppages would, on average, improve machine available time by 69 minutes per face per shift, leading to an increase in production of 700t per shift (Moore, 1990). Data from BC's national face databank for the 13 week period up to June 1990 reveals that machine running time as a proportion of machine available time was a mere 21 per cent, compared with a target rate of 40 per cent (source: DB75, British Coal data, privately supplied). The reduction of machine stoppages has become a major management problem at Selby, which management are able to tackle via the introduction of more sophisticated 'real time' monitoring systems.

The limitations of new technology impinge on questions of skill which are addressed in section 5. Management also intend that important innovations in work practices will play a part in increasing machine utilisation. Sections 6 and 7 examine the development of work practices and industrial relations at Selby in the light of these issues.

5. NEW TECHNOLOGY AND SKILLS AT SELBY

The most advanced technological systems developed by BC are standard at Selby. Early research on advanced technology mining predicted that the high levels of automation would have significant implications for the organisation and content of labour. The early critical literature implied that the high levels of productivity associated with the new technology would be predicated on the widespread deskilling of the workforce (Burns et al, 1985; Winterton, 1985). However, evidence from Selby, although offering some support for the notion that new technologies are deskilling the workforce, also suggests different motivations behind management's introduction of new automated technologies and its attempts to recast its relationship with its workforce. The post-Fordist thesis, however, would suggest that the level of automation at Selby would lead to the demand for more skilled labour in order to optimise its operation. Two important examples of automation at Selby, both of which are claimed to lead to higher levels of performance are automatic steering of shearers and automated health monitoring of plant and, significantly, the automation of maintenance skills. These technologies and their impact on the organisation of work are examined in some detail below.

Autosteering

Conventionally, shearer drivers steer their machines relative to dirt bands within the seam. At Selby the nature of the seams means that this feature is absent or inconsistent. Therefore, steering is very difficult as it is impossible to predict where the coal/dirt interface is. Consequently BC have introduced a number of nucleonic and natural gamma forms of steering at Selby which utilise the differential gamma ray absorption properties of coal and shale to determine the thickness of the immediate coal roof. With ranging drum shearers of the type used at Selby, the information generated thus was used by the shearer driver to help him guide the cutting disc along the correct cutting horizon. The systems used at Selby automate this residual manual function. This has been achieved by the use of a machine mounted micro-computer which acts upon inputs from a number of transducers. The autosteering systems, notably MIDAS, have a 'personality' unit through which site specific constants can be configured:

> The micro-computer is the machine man's 'brain', the transducer his 'eyes' and the personality unit his long term 'memory'...At the heart of the MIDAS software is the active decision maker: the steering algorithm. This simulates the thought processes of a trained machine man (Laws, 1989: 329).

Systems such as MIDAS provide automatic vertical steering, maintenance information and management information. The latter is 'very advantageous to the control and accountability of the workforce' (Laws, 1989: 391) and is available in some detail:

> The management information available through MIDAS is unbiased, accurate, up to the minute and available in user friendly printouts. Details of the available information include

machine positions against time stoppages; machine running time per shift; and face profiles and coal thickness for each shear (Laws 1989: 330-2).

All faces at Selby are equipped with autosteering and its use at Riccall is reported to have increased face outputs by 50 per cent (Colliery Guardian, September 1989: 269).

The deskilling tendencies within such a system seem manifest. However, it is clear that autosteering has not worked in the manner anticipated by management and begs wider questions about the performance of technical systems at Selby and the relationship of labour to this technology. At either end of the face, manual operations have to take place and the machine driver has to handle the controls. In theory after leaving the face ends automatic control should be resumed immediately. At Selby management have been engaged in a struggle to cajole machine drivers not to operate the machines manually after leaving the face ends. Further technical limits arise when geological problems occur which are outside of the machine's capability such as roof falls, or dirt intrusions which can damage the automatic steering components and necessitate manual operation. Also, it appears that machine drivers find it difficult to judge when the shearer should be operated manually or automatically, a function which of course remains a human one. Few machine drivers seemed aware of the principles underlying autosteering and some reported poor or non-existent training[10].

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[10]In addition to discussions with machine drivers, these comments
(Footnote Continued)

Part of the machine operators reluctance to use autosteering derives from a lack of faith in the technical capabilities of the device rather than fears about deskilling. In particular, face men were concerned that management's experiments with new technology had led to face stoppages which had cost them lost bonus payments. Problems with the microelectronics caused numerous failures when autosteering was first introduced. On the other hand when autosteering works machine operators report their job as being 'to follow the machine' rather than to drive it, prompting one electrician (jokingly) to describe face men as 'the highest paid butt men in the pit'.

In general two principles underlie the introduction of autosteering at Selby, in addition to reducing management's reliance on skilled machine drivers. Firstly, it represents an attempt to build-in a quality control function to coalgetting rather than to leave it until the ROM reaches the surface. Secondly, autosteering is concerned with establishing an even flow of coal from the face, through optimising the speed of the machine as it traverses the face. To this extent, the real significance of autosteering appears to lie in integrating the production rate at the face more closely with the capacities of the backbye infrastructure. Although, in principle autosteering deskills workers, in practice it does so only marginally because room for human intervention still remains.

(Footnote Continued)
are based on observations of H203s at Stillingfleet made on an underground visit in July 1990. Management at that time were struggling to introduce MIDAS principally as a result of quality concerns.

Most complaints from workers surrounded inadequate training rather than potential deskilling.

The automation of maintenance skills

The widespread incorporation of transducers for monitoring the health of machines and diagnosing faults can be seen in a similar light to autosteering. Transducers are incorporated into virtually all plant such as belts, fans, pumps as well as transfer points. All transfer points are monitored at outstations which give on-line information on bearing temperatures, vibration levels, alignments and so on. The outstations themselves are connected to the surface control. Control room operators can then contact an electrician and allocate him to an outstation if it is registering a signal fault. The outstation will indicate the location and nature of the fault on a VDU. The effect of all this is to aid the rapid deployment of craftsmen and the quicker rectification of faults. The level of monitoring is far in excess of that prevailing in North East pits where transducer-based monitoring has not proceeded beyond stop/start functions. The same tendencies toward the erosion of electrical skills associated with panel changes were identified by craftsmen. However, at Selby the automation of maintenance skills had progressed to a much farther degree, notably through the development and use of expert systems.

At Selby, BC use the SHEARER system for 'automating skilled diagnosis and decision support in a complex, time pressured production environment with safety-related considerations' (DTI, 1990: 6). This

system was originally developed in order to quicken response to machine failure on AM5000 shearers (which are in use at Stillingfleet, Wistow and Riccall) and to reduce the skill requirements of maintenance staff. On an average face, use of the system is estimated to have saved BC almost £1.5m per annum in output losses. It represents a step forward from transducer-based monitoring which requires expensive fitting, retrofitting and maintenance. SHEARER can be easily interfaced with the real-time computer monitoring system CIS-VAX which is used at all the Selby pits (see DTI, 1990, for a full description). The impact on skills appears clear cut:

> SHEARER operates as a stand-alone system, and has no inputs direct from the coal cutting machine. When a fault occurs, testing and repair procedures are carried out by a member of the maintenance staff working on the machine at the coal-face. SHEARER runs on a computer at the surface, and the maintenance staff working underground are linked by voice telephone to the surface computer operator, who relays the information from the screen as the diagnosis proceeds. The operator can be anyone who can use a computer keyboard (DTI, 1990: 18)[11].

An advantage of the system from management's point of view is that it allows the automation of both fitters' and electricians' skills. Combined with the use of transducers where appropriate and the widespread use of RCM the net effect of such systems is to speed up and make more efficient the fault finding process. An electrician at Riccall observed:

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[11]Moreover: 'As well as following a diagnostic process, SHEARER gives a wide range of advice needed to return the failed machine to service. This includes diagnostic 'tips', identification of parts using location diagrams, provision of parts numbers, and remedial instructions. Advice may be directed to either a full repair or a temporary one. SHEARER's output is in the form of text, plus full screen diagrams to show the location of parts or to clarify some other point' (DTI, 1990: 18).

> It's made diagnosis of a fault easier. It does show you what is wrong. You've still got to rectify it, but actual fault finding is easier. With this level of technology its got to be. I'm lost with a lot of stuff that we use now. But I can follow a read out and change a part. To start fault finding yourself - it takes some time...With production the way it is that takes too long. They want that fault indicating...It's about preventing faults and if there is a fault getting it done quicker, that's what it is about...Its a different type of skill...Ultimate now, if you're lost, you get on the phone and get somebody on who knows something about it...They'll be in the office and they'll say: right, take this step, take that step. They're all wrote out and it's all monitored.

Like autosteering, the progressive automation maintenance skills is eroding traditional competences, but beyond this its real significance appears to relate to the wider effort of minimising possible downtimes. Moreover, while SHEARER certainly deskills the craftworker, its development, at least in part, was a response to the haemorrhage of skilled craftsmen from the industry after the 1984/5 strike and the need to automate specialised knowledge before it was lost (DTI, 1990).

Few craftsmen appear unduly concerned with deskilling - a fact that is made more remarkable when it is considered that most of those interviewed for this study were union activists and, presumably, were more inclined toward this interpretation. Craftsmen tend rather to complain about inadequate levels of training. Although the early management literature emphasised the need for massive retraining of miners from closing pits before they moved to Selby (eg Rees, 1976a), this simply did not occur. A craftsman, asked to compare work at Selby with work at his previous pit, offered what seemed to be the general assessment of the nature of maintenance work at the complex:

> The skills gone out of it. Men know they're being deskilled. The craftsmen are garage mechanics now, more or less told what to do. They're spare part replacers now, more or less...They do less repairing, it's new for old...They're not

> hi-tech people. They're people from a 105 year old pit, who've gone to a very new pit and are more or less just told what to do. They're not whizz kids. The comment you hear is: a monkey could do this[12].

As well as deskilling, however, it was also possible to identify limited forms of enhanced semi-skilled maintenance work at Selby. In collieries in the central coalfield it has been the practice to employ non-time served chock maintenance staff (so-called 'chock doctors') whose sole function has been the maintenance of the hydraulic systems which propel the face roof supports. At Selby all such chocks are now operated electronically using a push button system, rather than through hydraulic lever systems. With union assent the chock doctors have been retrained in the basic electronic skills necessary for the maintenance of this plant. As such this might be offered as an example of upskilling although the level of such skills remains comparatively low. The apparent aim of this development is to save on waiting time in the event of an electronic failure. The former semi-skilled fitter can now begin changing panels before the arrival of an electrician. Whether the expanded responsibilities of the chock doctors foreshadow the emergence of a genuine electromechanic remains to be seen. At present, there is no evidence that BC is prepared to invest the large amounts of time and money necessary to bring this about[13].

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[12]BC have introduced the much publicised 'Skillscope' initiative. The Skillscope training modules and exercises tend to emphasise speed in fault finding rather than the development of new skills as such. Skillscope was regarded cynically by miners and craftworkers because of its emphasis on unpaid home learning through the use of tapes and so on.

[13]Despite much sound and fury regarding the creation of
(Footnote Continued)

The craftsmen's skill is more a question of how rapidly he can rectify a fault, often through a process of elimination, rather than his ability to trace and diagnose a fault. These latter functions are now being incorporated into the machinery itself. The attempt to shift the concerns of the workforce in the direction of intensive plant utilisation is perhaps exemplified by the introduction of 'Analytical Trouble Shooting' (ATS) at Selby. ATS is a problem solving technique developed by a US company called Kepner-Tregoe and is explicitly designed to engage the workforce in the struggle for 'system optimisation' and is presented as representative of management's desire for cooperative industrial relations (see Gardner, 1989: 469-71).

ATS is seen by management as complementing other forms of IT-based delay analysis. At Selby all management staff, machine operators and craftsmen have been trained in these techniques, as well as certain other groups such as belt patrolmen. BC have stated their intention to train workers in these techniques, with the hope that a more 'proactive' workforce will be created. According to one member of management:

> Analytical trouble-shooting pushes problem analysis and solving right down to where it belongs - the lads on the face. Its a technique that is built around and relies on the shopfloor workers. He has first-hand information and is the best placed of anybody to see what is happening...From our experience so far, ATS generates a high degree of commitment from the workforce because we are asking them to use their heads. It's also confirmed what we already knew;

(Footnote Continued)
electro-mechanics (eg. Wheeler, 1986; also Chapter Four) there was no evidence of the emergence of such a category at Selby.

> that there's a rich seam of untapped potential when it comes to pitmatics - the men who are doing the job (internal document).

Interdisciplinary management groups hold Kepner-Tregoe meetings at each of the mines. At some mines in the complex, notably Riccall, the ATS techniques are incorporated into team briefings for workers about to undertake major salvages. Here management hold team discussions away from the pit at the nearby Mines Rescue Station prior to salvages and installations. More generally, however, management appear to hope that the workforce will now become constantly on their guard against systems working at less than potential and take immediate action to ensure rectification. The system was first introduced at Whitemoor mine where it was planned to train 65 per cent of the workforce in these techniques by the end of 1990[14].

There is no doubt that ATS is sold to the workforce as part of a quasi-cooperative approach to production organisation. Some workers who were among the first to be trained in these techniques, described how they received 'pep-talks' from the colliery manager before going on the course, who told them that they were not about to be 'brainwashed'. Some workers were undoubtedly enthused by ATS, while others remained cynical. In addition most interviewees reported

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[14]Management have given examples of successes using ATS. However, such successes appear to reflect less the value of the techniques themselves than a generally creative attitude on the part of workers. The introduction of ATS appears to correspond closely to Kern and Schumann's notion of the worker in the new automated plant as a 'scout', sensitive to the constant possibility of breakdown.

that following an initial surge in interest, the enthusiasm of management has waned. Moreover, it appears that management struggled to introduce ATS in the charged atmosphere of the late 1980s. In particular, management refused to negotiate its introduction with union branches or to accede to union demands that a branch official attend each ATS briefing.

There is no equivalent of ATS in the North East (none of my informants - management or workers - had even heard of it) and its introduction at Selby is suggestive of recognition by management that such a capital-intensive installation required a new type of relationship with the workforce. ATS is a clear attempt to introduce a more cooperative type of labour relations, and appears to owe something to such a vision of the future held (somewhat vaguely) by the mine's early planners. In practice the industrial relations strategies of management have been more contradictory than is suggested by the development of a quality circle approach. For instance ATS was introduced during a period when management had provoked major confrontations with the workforce. Section six examines the attempt to recruit and mould a workforce suitable to the production environment at Selby and how these management strategies foundered. This process can be attributed partly to the growing unrest in the Yorkshire coalfield prior to 1984/5. Section seven examines post-strike events at Selby and places developments such ATS in a broader context, thus illustrating their contradictory application.

6. INDUSTRIAL RELATIONS AND WORK PRACTICES AT SELBY

Creating a workforce for Selby

It was argued above that the technical systems which the National Coal Board had been developing in the 1970s and early 1980s had their fullest expression at Selby. Given that the NCB had been developing proposals for the alteration of work practices, it would seem safe to assume that these would be similarly well developed at Selby. In the light of these requirements it appears that in the early period of the development of the complex (1980-1984) there was a real attempt by the NCB to recast the relationships which had traditionally existed between management and workers in the coal industry. The early literature on Selby used a language which, if somewhat vague and overblown, was akin to that which characterises some of the 'post-Fordist' debate:

> By comparison with traditional mines, the Selby pits will be modest employers of labour - perhaps 200 or so men per shift at each...Selby is to be a high technology development whose employees will be technicians not labourers. Automatic monitoring, electronic alarm systems, closed circuit televisions and a network of two-way telephones...will make it possible to control operations from a small number of strategic points (Pollard, 1976: 105).

In addition, it seems clear that, given the anticipated expansion in the size of the industry embodied in the PFC, Selby, in large part, was expected to be operated by 'green' labour, recruited locally[15]. This gave added impetus to the conception of Selby as a 'modern' mine, free

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[15]At the public enquiry the NCB attempted to present the mine as both a source of employment for local people and as representing no threat to existing employers (eg. Bugler, 1976).

of many of the traditional problems associated with coal production. In the event, the contraction of the coal industry meant that the labour force at the mine was to comprise miners from declining parts of the Yorkshire coalfield. From the outset, therefore, the operation of this new mine was to be complicated by the fact that its workforce was to arrive with traditions of custom and practice and a strong bargaining awareness from other Yorkshire pits (see Thomas, 1983).

On the other hand, the uneven nature of the decline of the coalfield meant that while among existing collieries within Yorkshire there was much modern, low cost capacity, this tended to be concentrated in the south of the region. This area had, and continues to have, a record of industrial militancy. By contrast, the coalfield around West Yorkshire which was in decline had, according to the NCB's official historian, 'a very long tradition of very good labour relations' (Ashworth, 1986: 380n). The NCB began recruiting a workforce for the Selby coalfield from West Yorkshire.

This process is exemplified by the case of Riccall. When Riccall was being developed in late 1983, the management there began a series of meetings with workers at Newmarket colliery, near Wakefield, which was about to close because of exhausted reserves. Newmarket conformed closely to the stereotype of West Yorkshire pits. The aim of the meetings was to attempt to persuade Newmarket men to transfer to Riccall. This process extended to guided tours of the complex for the men and their families and the provision of special services to help them overcome the upheaval of change. Such a degree of attention on the

part of management was hitherto unknown to the men and was considered indicative of the new climate of industrial relations which was to prevail at the colliery (see Stott, 1989, for one account)[16].

Miners at West Yorkshire pits which were about to close were faced with the option of commuting to Selby or moving home to the area. In the event, in excess of 50 per cent of the current workforce lives within the vicinity of the complex. The NCB and the local planning authority were faced with a number of difficulties in integrating up to 4,000 miners into the Selby district, but throughout the whole period the Board appeared to be conscious of how production relations could be broadened at Selby into the wider community. Those who elected to move were offered an effective mortgage subsidy to encourage them to purchase a house, which amounted to £15,000 over seven years, and which was added onto the wage slip. By using the subsidy system many miners were able to trade-up in the housing market. Simultaneously, according to a management source, the NCB took 'a political decision' to prevent the formation of 'a strong mining community'. The building of large estates for the mining workforce was

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[16]In fact there is fairly clear evidence that in the early period, at least, management discriminated in favour of potential recruits from pits with quiescent labour traditions. According to Winterton and Winterton: 'the NCB has allowed moderate collieries (including Glasshoughton and Savile) to close before exhaustion so that their workforce can transfer to Selby' (1989: 7). Whereas miners from the closing Featherstone pits which had a more militant reputation (such as Ackton Hall) tended to be dispersed to a larger number of existing pits such as Allerton Bywater and Prince of Wales (ibid).

eschewed in favour dispersing the workforce throughout the many small farming villages in the area.

Regardless of whether men actually moved home, a powerful incentive to becoming a Selby miner was the high level bonus payments obtained by the workforce in the period prior to and shortly after the miners' strike of 1984/85. At this time men could regularly earn around £250 per week in addition to their basic pay. The impression given was that Selby was to be operated on the basis of a high wage/high productivity bargain. (Subsequently bonus payments fell dramatically and tended to fluctuate significantly from week to week. This caused many industrial disputes, see section seven).

These attempts by management to build a new relationship with its workers, however, were frustrated by intractable industrial relations problems, which reflected local and national factors (eg. Thomas, 1983). Locally, disputes tended to reflect the workforce's determination to ensure a consistently high level of bonus payments. This might seem paradoxical given earlier remarks about the efforts of the NCB to select a workforce from moderate areas of the declining coalfield. This paradox reflects (partly at least) the assumption of positions of power within the NUM of a group of well organised, militant miners who were able to set an industrial and political climate in the complex which was at odds with that hoped for by the NCB. Selby miners also took part in the nationally organised overtime ban which culminated in the 1984/85 struggle against the NCB's pit closure programme. More generally, it seems the NCB's hopes for a new relationship with its workforce were

bound to be frustrated given the heightening political and industrial tension in the Yorkshire coalfield and beyond during this period. Selby miners could not remain immune from this atmosphere, not the least because many still had relatives working in other pits in other parts of Yorkshire. Nevertheless, the type of production relations which were becoming established in the pre-strike period were to have a material effect on the outcome of the strike in Yorkshire.

The strike and its aftermath at Selby

The 1984/85 strike represented a turning point for the Selby complex as well as for the industry nationally. While in Yorkshire as a whole there was strong support for the strike, at Selby support proved to be relatively weak. When the strike ended in March 1985, at pits in the heart of the Yorkshire coalfield less than 5 per cent of the workforce had broken the strike, whereas in Selby the corresponding figure was over 50 per cent (Winterton and Winterton 1989: chapter 6). This situation could be attributed to a sectionally based perception of the issues held by miners at Selby, ie. the knowledge that the complex was immune from the closure pressures which faced pits elsewhere. However, it is also clear that the collapse of the strike at Selby reflected the type of production relations which had been established there. In particular, it seems that the absence of a discernible mining community to offer solidarity and the crushing burden of mortgage debt experienced by those who had bought relatively high value homes in the Selby district were crucial explanatory factors. Winterton and Winterton, for instance, report that a group of Wistow miners agreed to

return to work when their mortgage arrears reached £3,000 (1989: 136). In general, they suggest financial difficulties were a particularly prevalent reason for strikebreaking at Selby.

The defeat of the strike had important consequences for the development of production relations at Selby after 1985. The national ascendancy of management hardliners (see Chapter Four) was matched locally. In the immediate aftermath of the strike, significant changes were made to the management bureaucracy. Albert Tuke was appointed director of the North Yorkshire area of the NCB. Tuke had been associated with that faction of the management which was opposed to a negotiated settlement of the strike and had organised systematic strikebreaking in the Doncaster area. Managerial responsibility for the Selby complex was given to Robert Siddall, another member of the hardline faction, and who during the strike had responded to tales of miners' hardship by telling them to 'eat grass'. In this context the aspirations of the pre-strike period for a new industrial relations bargain looked unlikely to be continued. Indeed miners at Selby walked out following Siddall's first visit to the complex. The climate of industrial relations changed dramatically, with management using the defeat of the strike as an opportunity to 'put the boot in', according to a management source. Workers who transferred to Selby in the period after the strike were not treated to the same 'hard sell' in order to persuade them to move. A Riccall miner describes the gradual change in management attitude:

> Before strike them lads that went - ex-Newmarket men - they took them round on a bus for the day and showed them the area. After strike, to us, they said: there's a job going at Selby - do you want it? We had to go sign on and start on

> the Monday. We did had some time to think about it, like...Now there's lads come up from Betteshanger. I were talking to one - Paul - and there they shut pit on the Wednesday and they were given two and half days to make their mind up to come - what is it? - 300 miles from Deal. Two and half days to make their bloody mind up. I feel sorry for them lads...Its just gone from bad to worse.

One of the first acts of management following the resumption of work was to consolidate their victory by playing on divisions between workers. At Riccall, for instance, management set about breaking up work groups which included die hard supporters of the strike. This even extended to reallocating lockers at the pit baths so that 'scabs' and 'solid lads' were mixed in together. Strike supporters were set alongside strikebreakers in work teams underground. At all the pits traditional trade union privileges (such as union shifts) were altered.

Work practices at Selby in the post-strike period have been an amalgam of the regressive erosion of privileges and the exercise of new-found managerial authority characteristic of other parts of the British coalfield, alongside, at the same time, attempts to introduce innovative developments - such as ATS and the extensive and impressive use of direct communication with the workforce via regular newspapers and magazines - which owe something to the ideals of cooperatively based industrial relations which appear to have been in the minds of the original planners.

Following a period of retreat and regrouping at the end of the national strike industrial relations at Selby where characterised by a series of 'ragouts'. Between January 1986 and March 1987 there were 51 unofficial disputes at the complex which management estimated had led

to losses of £13m (Yorkshire Evening Post, 3.8.87). According to local union officials these disputes reflected a determination to resist the new management offensive which manifested itself in the form of an attack on trade union privileges, new working practices, higher levels of supervision and reduced levels of bonus payment. The industrial relations problems of the complex were held up as an example of residual militancy despite the crushing of the miners' strike (eg. Sunday Times, 11.10.87).

The period from 1986 was characterised both by hardening management attitudes and surprising amounts of resistance on the part of the workforce. In January 1986 Stillingfleet men walked out after management stopped the pay of men who arrived late for work during adverse weather conditions. The colliery manager at that time wrote to the NUM branch Secretary Ted Scott claiming he had 'deliberately caused men to take strike action' and warned that future action would be regarded as 'a serious breach of the existing machinery' (quoted in Winterton and Winterton, 1989: 223). In response to the threat an overtime ban was instituted but was called off after Albert Tuke sought an injunction. The scale of the disputes continued to escalate.

Whereas prior to the 1984/5 strike the incidence of disputes reflected attempts, in the words of a branch official 'to set standards down for the life of the colliery' and as such reflected the strength of the workforce, the strikes after 1984/5 were essentially defensive attempts to resist managements attempts to alter working practices. Section 7 charts the changes in work practices following the strike.

7. RESTRUCTURING WORK PRACTICES AT SELBY

Attempts to alter working practices reflected the wider management offensive of the post-strike period and the ascendancy of management hardliners described previously. However, the character of change at Selby was also influenced by the specific nature of the production problems. Equally, the strength of the workforce's resistance initially at least reflected its knowledge of the centrality of the Selby mine to BC's operations and the strength which this accorded to them.

Incentives: the emergence of the Selby Agreement

The main cause of the disputes after 1985 lay in the operation of the bonus system. Prior to the national strike, Selby operated the Yorkshire Area agreement, the local variant of the 1977/8 Area Incentive Agreement. This agreement applied to drivages and to the only face in operation at that time, A1s at Wistow. Many disputes occurred under the terms of this agreement, including stoppages on A1s (see Thomas, 1983). In the period since the strike BC have introduced a number of alternatives to the Yorkshire Area agreement, the most widely publicised being the 'Doncaster Option' discussed in chapter 4. The pioneering aspect of the Doncaster Option from BC's viewpoint was that it introduced payments based on tonnes produced rather than yards advanced.

The Doncaster Option has provided a model for management to introduce locally based variations[17]. At Selby management in the post-strike period have moved, somewhat gradually, in the direction of the Doncaster Option. A new incentive agreement was introduced at the end of 1987, coinciding with the appointment of Albert Tuke as Area Director. This agreement was nominally a tonnage based one: bonus was to be paid according to a tonnage scale, but this was expressed in strips at standard web depth or metres at standard web depth. Slight variations of this scheme were introduced at all the mines as they came into production. In contrast to the existing bonus arrangements face workers were not to be compensated for delays unless they lasted for longer than 50 per cent of MAT. Under the revised system introduced at Riccall, the face rate at standard (determined by method study) was raised from £7 (as under the Yorkshire agreement) to £14, in order to compensate for the loss of payments for delays. To obtain the pit bonus, the rate at standard was calculated on the basis of 87 per cent of the face rate at standard, so that if both faces achieved standard (£14 per shift) the pit bonus would be £12.18. Non-face workers would then receive their allotted percentage of this figure. For those outbye,

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[17]The Doncaster Option was introduced because BC recognised that local union branches had wrung significant concessions on pay from management under the Yorkshire agreement, to the extent that by 1981, in terms of the national coalfields league table, Doncaster pits earned the second highest average incentive pay for the seventh highest area performance. In 1984 BC's senior management called on Area directors to suggest alterations to the existing incentive arrangements. In response to this three (then) area directors - Albert Tuke, John Northard and Ken Moses - suggested a 'task achieved bonus' for installation work, and a 'tonnage achieved bonus' for others, based on saleable ouput. These suggestions formed the basis of the Doncaster Option (see NUM, 1986).

full shift delays on either face were compensated at 75 per cent of the shift average[18].

One aim of the new scheme was clearly to increase incentives at the face, although, in practice, it served also to exacerbate the existing dissatisfaction which translated into disputes. In particular, while facemen could make good bonuses, stoppages reduced the pit average. This meant that those working elsewhere below ground often took home very small bonus payments. The system resolved very little for BC, and generated a number of disputes. A new scheme was proposed in the summer of 1989 which was introduced at Riccall and after some resistance extended to other mines in the complex with Stillingfleet the last to sign up. The new system is explicitly tonnage based.

Although formally the result of negotiations between unions and management, the scheme was regarded by some branch officials as worse than the system it replaced. Under this scheme - the Selby Mines Incentive Bonus Agreement - the tonnage stipulated is revenue tonnage with an ash content of 18 per cent or less. Bonus payments begin when 16000t are produced for which £8 per shift is paid, with increments of 50p per 1,000t following. In the event of the standard

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[18]The new scheme provoked a number of stoppages. All 3,000 Selby miners struck for a week in early 1987 over bonus payments and 'jackboot management' in action estimated to have cost BC £1.5m. Management had stopped a week's bonus after one day walkout in protest at the visit of Robert Siddall (Yorkshire Evening Post, 16.2.87). In January 1988 800 men struck at Wistow after claiming that management had failed to take into account production problems and conveyor stoppages in the bonus calculation for the previous week (Yorkshire Evening Post, 28.1.88).

not being met, the £8 acts as a fall back rate under the following circumstances: full cooperation is obtained from the workforce and there are no disputes; developments perform to standard; and a local dispute procedure is agreed and abided by. Faceworkers receive a supplement for each percentage point above 90 per cent of the agreed standard performance. Other measurable work is renumerated under separate contracts. A 100 per cent payment of £10 per shift is paid, with a fall back rate of £6.50. However, no allowance is made for delays or redeployments under this system, except full shift delays. Finally, all bonus earners can earn a lump sum based on pit performance. The payment is £125 payable at the end of any financial quarter achieving an average 50,000t per week during the thirteen weeks of the quarter. If the annual tonnage averages 45,000 a week or more (based on 50 weeks) a lump sum will be paid at the end of the financial year according to a scale. Theoretically, it is possible to earn £1,250 if an average 60,000t is produced per week. However, this bonus is only paid for 100 per cent attendance and is forfeited if any industrial action occurs during the period in question[19].

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[19]This system did not resolve the motivation issue at Selby along the lines suggested by Richardson and Wood's (1988) study in South Yorkshire. Levels of morale among non-face and development workers remained low. At Gascoigne Wood, for instance, bonus is calculated according to the complex average. Branch officals pointed out that while all pits at the complex will at some stage make good money when production is high, the fact there are always pits which are doing badly brings the complex average down. Workers at Gascoigne Wood it seems, will always find it difficult to earn high bonuses. The motivation of face teams has been questioned when they are on the fallback rate. One mine manager revealed his frustration: 'These [high] earnings will only be achieved by a determination to earn, to go forward from fall back to earning money and not by anybody taking the view that he will not work

(Footnote Continued)

The Selby Agreement, therefore, has two main features; firstly, miners wages were more closely linked to the performance of the pit and, secondly, through its stipulations concerning the ash content of ROM output and industrial action, and its lack of payments for delays, it integrates more closely the payment system with the broader imperative of ensuring continuous production. In short, the costs of production shortfalls are placed more squarely on the shoulders of the workforce.

On the face of it, the new agreement represents a step backwards for the workforce, and prompts the question of why the union branches agreed to its introduction. In fact, acceptance of the scheme took much longer at some pits - notably Stillingfleet - than others. The introduction of the scheme was effected first at Riccall mine. Some union officials claim that Riccall represents the 'weak link' in the union structure at Selby and accuse the branch there of having a cosy relationship with management and it does seem that management have used Riccall as a stalking horse for a variety of innovations in work practices at Selby such as the use of ad hoc contracts[20].

(Footnote Continued)
enthusiastically if he is on fallback. Taking that stance is only likely to prolong the period of time we are on fallback'.

[20]In fact the politics of industrial relations at Riccall are complex. The management's ability to secure the agreement of the branch for the Selby Agreement reflects an accommodative relationship between management and union. This appears to reflect, in large part, the influence of one man - Steve Widdrington - a respected former union official at Riccall who following the defeat of the miners' strike joined the management. Widdrington has been instrumental in attempting to create a new climate of non-conflictual industrial relations there. Widdrington is a controversial figure who had previously been prominent in the Left in the Yorkshire NUM. At his previous pit, Park Hill, he
(Footnote Continued)

Management at Riccall were assisted by the traditions of moderation established in the earliest days of the mine by the branch officials, of whom many were Newmarket men. On the basis of this relationship the workforce at Riccall were apparently persuaded to accept the new bonus arrangement. The fact that following the introduction of the Selby Agreement at Riccall in September 1989, workers there made large bonuses appears to have persuaded the workforce at other mines to accept it. While there was dissatisfaction with the new agreement, reflected most obviously in the resistance of Stillingfleet branch, the gradual acceptance of the Selby Agreement in 1989/90 appeared to signal the beginning of a quieter period of labour relations at Selby. This new found quiescence reflected the outcome of struggles over coaling in overtime at Selby.

The push for flexibility

Management have attempted to introduce forms of flexible work practices which appear to complement those made necessary by the introduction of new technology. In the period following the strike management at the complex attempted to introduce craftsmen as machine operators (similar to Kern and Schumann's 'production mechanic'). A particular effort

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(Footnote Continued)
was branch secretary alongside Ken Capstick a prominent figure in national Left, who later became a branch official of the militant Stillingfleet NUM. Widdrington had been a prominent organiser of strike activities during 1984/5 including the celebrated blockade of the Selby toll bridge. Winterton and Winterton (1989: 237) suggest that his defection to management was a blow to the 'credibility' of the Left at Selby. Whether or not this is true, his role in events at Riccall and in the complex as a whole is important.

was made at Riccall where management expressed a desire to have fitters operating machines, in order that they could utilise their knowledge of machine tolerances during production. The NUM branch opposed this policy and even 'sent to Coventry' two craftsmen prepared to cooperate with management. The opposition of the union was enough to scupper the plan at that stage.

A high degree of temporal flexibility is obtained at Selby through the use of overtime. The rapid growth in the use of overtime by management as a key production factor has been charted as a general feature of the post-strike period. Selby is no exception to this rule. Overtime earnings now comprise a high proportion of the miner's earnings at Selby and assume even greater significance when bonus payments are low. Overtime earnings can be used also as an important means of disciplining labour. A faceworker observed:

> A lot of lads at our pit are living from week to week. A hell of a lot of lads are living on strap [debt]. I mean its a social thing, but they'll see things, maybe a new car and they'll go out and get some strap and buy it. I mean its never easier to get strap than it is now. A lot of them don't work out their money to their basic wage. That is the biggest problem. A lot of them think: if I work Saturday/Sunday this week, I'll make so much. And they [the management] know this. They know who they can go to. There's one head overman and his biggest quote is: I'll remember that when t'weekend comes round. Meaning you'll not get any overtime. And that's what goes off.

Despite the widespread use of overtime at Selby, coaling in overtime appears to be far less common at Selby than in the North East. Although facemen report that 'if things are going well', they are often asked to stay to cover dead periods between shifts, very little coal production has taken place at weekend, except in the case of in-seam

drivages. This clearly reflects an attempt to overcome the technical problems, notably the relative slowness of drivages, described earlier. It seems slightly ironic that BC called for continuous coaling in order to operate highly capital intensive mines economically, yet at Selby there are technical obstacles to achieving this. In contrast where levels of investment are comparatively low, such as in the North East, continuous coaling has been systematised to a much higher degree.

Contractors

The widespread use of contractors was institutionalised at Selby from the outset and this was justified on grounds of cost. Contractors were responsible for the main development work at the complex including the drivage of the spine roads and the opening up of each pit prior to British Coal workers taking over coal getting activities. During the period of fieldwork, contractors were involved in opening out North Selby mine and driving the connecting road to the spine tunnels. Contractors continued to be used on a large scale for any works connected with the spine tunnels such as the backrips described earlier.

Given these considerations it was striking to discover that contract workers, by everybody's estimation, were earning significantly more than their British Coal counterparts. According to contract workers, such firms appeared unconcerned by the size of their wage bill:

> I wouldn't work if I was undercutting NCB lads, but we were earning more...We were going in there for some jobs and they were saying: get in there. And we'd say: what's the bonus? They'd say £20 a shift. And we'd look, like. And they'd say:

> gan on we'll give you £25 per shift. You didn't have to prove owt. Obviously you had to get yards out or they'd sharp show you where your jacket was. But they weren't coming in and measuring you up or owt. You could be on £20 per shift on a promise, not if you get there, like - its yours. Nothing was on the measure[21].

The production process in the development areas operated by the contractors was labour intensive. Outside of the spine roads most tunnelling was achieved through shotfiring. A great deal of the development process was carried out on the basis of 'spade work' and what North East miners term 'handballing': large groups of men were used to move heavy items of plant by dragging them with chains, whereas elsewhere in Selby FSV's would be used. The contractors tended to operate without demarcations and there was disquiet among contract workers about unsafe working practices in these areas. High rates of effort were maintained by the threat of instant dismissal and by what a contract miner termed the 'macho ethic' of work groups. The sophisticated monitoring technology used in the main coal-producing parts of the complex operated by BC itself were wholly absent and the work rate was maintained by the presence of the contract foreman[22].

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[21]This informant was a former Durham miner who commuted daily with two colleagues from the North East to Whitemoor and then North Selby while employed by Cementation during the development of the mines. North East miners provided a large part of the contract workforce during the later development stages of the mine.

[22]The development rate achieved by contractors remained substantially below that of BC itself. In the week ending 19.5.90 BC achieved a rate of advance of 3m per shift, while contractors achieved 1.33m per shift (Source: figures supplied by BC).

As the mines were opened the presence of contract firms was reduced. However major use of contractors continued to be made at Gascoigne Wood. Large numbers of contractors were employed on the backrips in the spine tunnels mentioned earlier and in the maintenance of belts and other outbye equipment. A large number of maintenance tasks were contracted out. For instance, locomotive maintenance is carried out by Hunslet, the loco manufacturer. According to NUM officials at Gascoigne Wood some 600 of the 700 strong workforce there are contract workers. Here also contract workers were earning more than the BC employees. The use of contract workers, though, held a number of advantages for BC. In theory at least it allows flexibility through the exact matching of the workforce to production requirements. In addition, the use of contractors seems to assist labour control. The rippers in the spine tunnels at Gascoigne Wood are potentially among the most powerful group of workers in the complex given their strategic role. However, there are enormous difficulties in acting on this power, because the companies for which they work are, in the words of one contract worker, 'hire and fire merchants'.

Work at Selby

Work rates at Selby are highly intensive. This work rate is engendered by the effects of the bonus systems described earlier, and by a sense, apparently shared by all workers, that all aspects of their performance are being monitored. A Wistow face electrician described how these pressures extend into the management hierarchy:

> To be fair to the overman on the face, they know Big Brother's watching them. They can't say: 'they're timbering

> above the chocks' when they're not...they've got to tell them what things are stood for.[23]

To the extent that monitoring technology is embodied in all plant, the pace of work is dictated to an increasing degree by the machinery itself. The high level of automation at Selby might suggest that effort levels might be reduced but remote monitoring and the bonus system ensure this is not the case. Effort rates are of a new, rather different order, as these comments from a Riccall branch official:

> You're on your go twice as much. Whether you're working physically harder is a different thing...Its more continuous, rather than more vigorous, like.

The essence of Selby is that work and technology appear to be integrated to a qualitatively greater degree. However, the notion that automation will follow its onward march seems highly suspect on the available evidence. As far as coal production is concerned the notion of the worker's role as one of iterative interventions designed merely to optimise machine performance seems as elusive as full automation itself.

8. CONCLUSION

In the introduction to this chapter, it was suggested that, in some degree, Selby could be conceived of as a post-Fordist mine. Born of the technical modernisation strategy of the late 1970s and the early

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[23]The same man reported his resentment at his work patterns and work rate being determined from a remote point: 'I don't need somebody telling me its broke down - I know its broke down. I don't need somebody up my arse saying find the fault - I'm trying to find the fault. Its my job to find it.'

1980s, it aspired explicitly to the regulated flow production of the automated factory. The hopes embodied in this vision led some commentators to make great claims for the productive capacity of Selby. Prior and McCloskey (1988) argued that the existing mine infrastructure and surface facilities at Selby could handle more than the planned annual output of 10mt. Similarly, they estimate that installed face equipment at each mine is capable of producing close to maximum potential. Operated on the basis on six day working, they estimate that the Selby mine could produce up to 20mtpa.

However, the evidence offered in the main body of this chapter would require such statements to be treated with extreme caution. The Selby Concept was based on a over-confidence about existing levels of technical prowess, combined with optimistic assessments of the geological structure of the coalfield. It seems clear that an initial belief that the geology of the coal deposits in the Vale of York was relatively unproblematic, led the then NCB to plans its development on the basis of maximum use of automated techniques. This option was pursued in the more or less explicit hope that the 'factoryization' of coal production, which has been the aim of the industry since powerloading was conceived, could be achieved there. However, production has been less than trouble-free and has been complicated by the unexpected quality problem.

The quality problem itself renders Prior and McCloskey's predictions for 20mtpa output suspect. In 1989/90 Selby despatched 5.6mt to Drax power station and planned to send 6.6mt in 1990/91. Newly installed

barrel washers have the capability to handle 20,000t of coal per week, sufficient to wash 4mt of run of mine - only half 8mt required to despatch 6.6mt of coal at 18 per cent ash. BC management maintain that average dirt content of run of mine will fall as major development work is completed. They argue that as revenue production develops the amount of 'clean' coal cut from faces (with a 14.5 per cent ash content) will increase in proportion to dirtier drivage coal and less washing will be required (International Coal Report, 23.3.90). Even this may prove to be optimistic, however, when it is borne in mind that BC is already using batch disposal of development dirt (Siddall, 1989) suggesting that the problem of dirt produced at the face and in in-seam drivages will still be significant. The problem of ensuring adequate development rates also suggests that caution should be exercised when predicting future performance levels, notwithstanding the proposed rise in development rates to the projected 80,000m in 1990/91.

Plans to increase output will in any event prove pointless unless BC can contain costs. In the financial year to 1989/90 the four currently producing Selby mines lost a combined £123.4m on a bottom line cost basis. Costs of production remained stubbornly high at Selby. In the 34 weeks to November 12 1989 bottom line costs of production (operating cost plus interest payments) in North Yorkshire Area (which at that time included Selby) were £2.29/gj, the second highest in the country. This reflects the high level of investment at Selby (for an indicator of which see Table 6.3) resulting in high capital charges. More worrying from BC's viewpoint is the fact that operating costs remained above those of every other coalfield except South Wales and Scotland. In the

North Yorkshire in the 34 weeks to November 1989 operating costs were £1.81/gj, compared, for example, to the North East area's operating cost of £1.47 (and bottom line cost of £1.51). BC announced a change in their accounting procedures to a 'cash cost' system from July 1990, which placed greater emphasis on cash flow rather than costs of coal produced. On this basis the fortunes of Selby mines are transformed, so that Riccall and Wistow are producing at 90p/gj, Stillingfleet at £1/gj and Whitemoor £1.20/gj. BC estimated that, on this basis, in the financial year 1991/92, the complex would move into profit (International Coal Report, 23.3.90). Whether this remains an accounting sleight of hand unconnected to real progress in production performance remains to be seen.

Where real changes have occurred is in the sphere of industrial relations. The pre-strike period represented an attempt to create an accommodative industrial relations at Selby, which was in part a development of the traditions of corporatism which had characterised the coal industry since nationalisation. The early period of Selby's development was accompanied by vague notions that a new type of labour force was required to operate the complex. However, progress in this direction was limited and ill-thought out. Moreover such attempts as were made were frustrated by, above all, the events of 1984/5. Following the miners' struggle against the NCB's colliery closure programme the possibilities of an accommodative relationship between unions and management at Selby were reduced. This reflected the ascendancy within management - at both national level and at Selby itself - of hardliners (represented locally through Tuke and Siddall)

who were dedicated to altering the balance of power in the industry firmly in favour of management. Attempts, therefore, to introduce cooperative work practices, such as ATS, could have only limited success. Despite the hopes of some members of management at Selby for a new 'post-Fordist' labour bargain, the dominant faction reproduced the Thatcherite rhetoric of 'asserting management's right to manage'.

Despite the collapse of the strike at Selby, the workforce proved militant following the resumption of work. However, management were able to inflict a serious defeat on the union, when it sacked Ted Scott, a leading figure in the NUM in July 1987. Scott was sacked for instructing miners at Wistow not to carry out weekend coaling - a key management objective. The incident occurred at the same time as the dispute over BC's new disciplinary code at Frickley in South Yorkshire. At the height of the Frickley dispute, Albert Tuke wrote to all North Yorkshire miners warning they would be liable to disciplinary action if they struck over Scott's dismissal. The issue of Scott's sacking became submerged in the wider debate about what action should be taken against the disciplinary code and no action was taken in Scott's defence. The significance of the dispute was largely that it was borne of a union attempt to place limits on management's drive for flexibility. Management took up the cudgels with enthusiasm and according to one member of management, Scott was sacked as an example to the workforce and the union. The union's failure to defend Scott appears to have represented a watershed in the post-strike fortunes of the union and workforce at Selby with a decline in the level of militancy,

although disputes have not been completely eradicated. The Selby industrial chaplain, the Rev. Gwynne Richardson, suggested this reflected a 'spirit of resignation' on the part of the workforce (quoted in Colliery Guardian, September 1988). In any event it is in the context of this defeat that the Selby Agreement was negotiated. It was certainly possible to detect an air of demoralisation among those workers to whom I spoke in late 1989 and early 1990.

Although in the post-strike period management appear to have set out to achieve a more quiescent workforce, given the production problems which management face at Selby this situation may prove counterproductive. It is doubtful whether a production facility of the complexity of Selby can achieve optimum performance on this basis.

In the summer of 1991 a flurry of publicity surrounded Selby most of which tended to confirm the findings of this chapter. British Coal were forced to respond to allegations that Selby had proved to be a 'geological nightmare', that it was unlikely to repay the costs of development, that Selby coal was being blended with North East output to make it acceptable to power station customers and that because of these factors the coalfield would close within 20 years (Private Eye, 16.8.91). British Coal admitted the coalfield 'has proved to have faults that are perhaps greater than any other coalfield in Britain' (Northern Echo, 16.8.91). Throughout 1990/91 management at Selby struggled with production costs which averaged £1.80/gj. BC stated their belief that costs would fall to £1.45/gj in 1991/2 with output planned to rise from 5.1mt to 6.8mt - somewhat short of 20mtpa suggested by Prior and

McCloskey. Some hopeful signs for management lay in the fact that profits for the first quarter of 1991 were £17m compared with a full year forecast of about £20m. At the same time union officials at the complex reported an improvement in the industrial relations climate with less aggressive management and improved pay (Financial Times, 19.8.91). Whether these developments provide the basis for the stable development of Selby over the long period remains an open question.

A comparative assessment of the pattern of restructuring in Selby and the North East is presented in Chapter Seven. In addition Chapter Seven analyses the features of the labour process at Selby in relation to the debates about the impact of microelectronics on the nature of work in large scale industry.

TABLE 6.1

SELBY MINE

Comparative Face Data for the Selby Complex

	1983	1987	1990
Number of Faces per machine:	5	3	3
Average hp. per machine:	400	400/500	
Estimated output:	2,000t	5,000t	
Estimated face productivity (OMS):	43.65t	80.00t	81.00t*
Powered roof supports:	4x450	4x450/650	4x450/720
Estimated value of face:	£3.7m	£5m	£9m

* Actual figure.

Source: Prior and McCloskey (1988); BC data privately supplied.

TABLE 6.2

SELBY MINE

Investment per man on books, North Yorkshire Area and Selby (£)

	Heavy Duty			Total Area		
	Selby*	Elsewhere	Total	Selby*	Elsewhere	Total
1981/2	-	191	189	346,161	4,886	9,497
1982/3	-	412	399	178,539	6,132	11,317
1983/4	4,996	172	425	91,192	5,144	9,658
1984/5	4,382	263	527	29,317	1,327	3,160
1985/6	-	117	106	39,312	2,981	6,429
1986/7	1,548	373	557	41,170	3,247	9,175
1987/8	5,834	529	1,510	50,620	2,307	11,234

*Based on men on books at Selby only.

Source: Haynes (1989: 369).

TABLE 6.3

SELBY MINE

Production Delays for Selby Mine (selected data)

Mine	Weekly production (t)	Lost time (Minutes)	Lost time (%)
Riccall	60,955	1,789	17.0
Stillingfleet	72,471	2,400	22.8
Wistow (H37)	45,463	798	15.2
Stllingfleet (H202)	47,179	952	18.1

Source: Moore (1990: 373)

Figure 6.1

The Selby coalfield

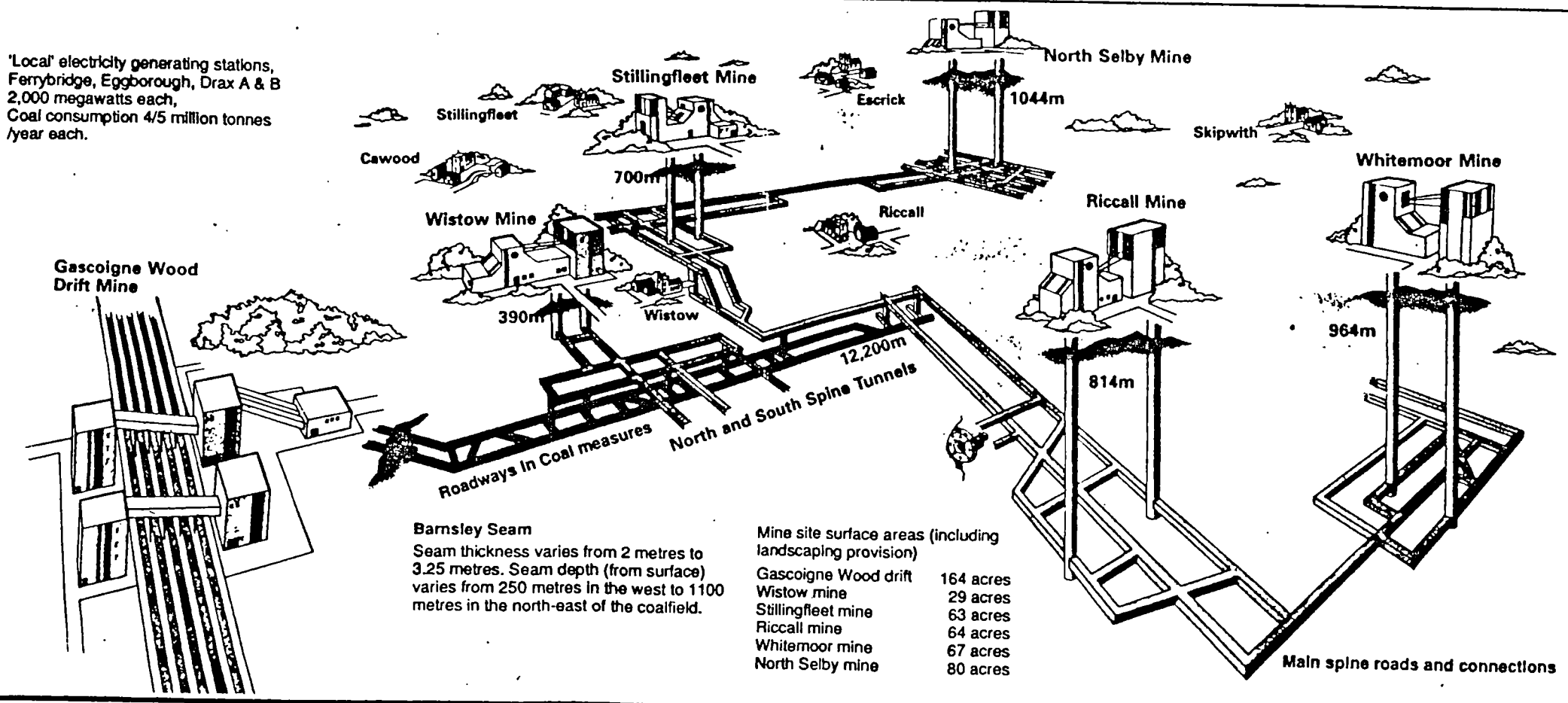


Figure 6.2

SELBY MINE

Improvements in coal clearance equipment running time, Gascoigne Wood

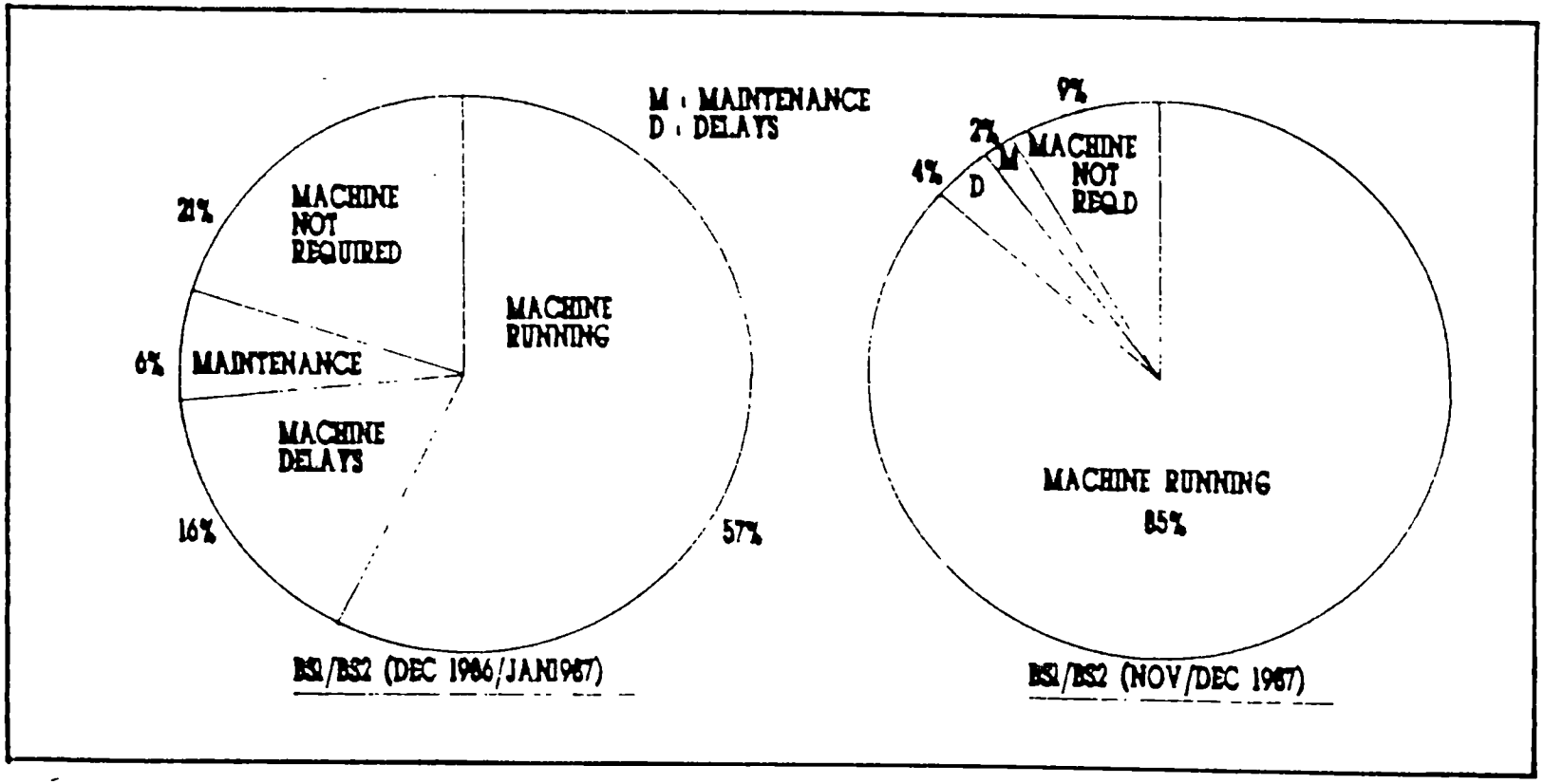


Figure 6.3

SELBY MINE

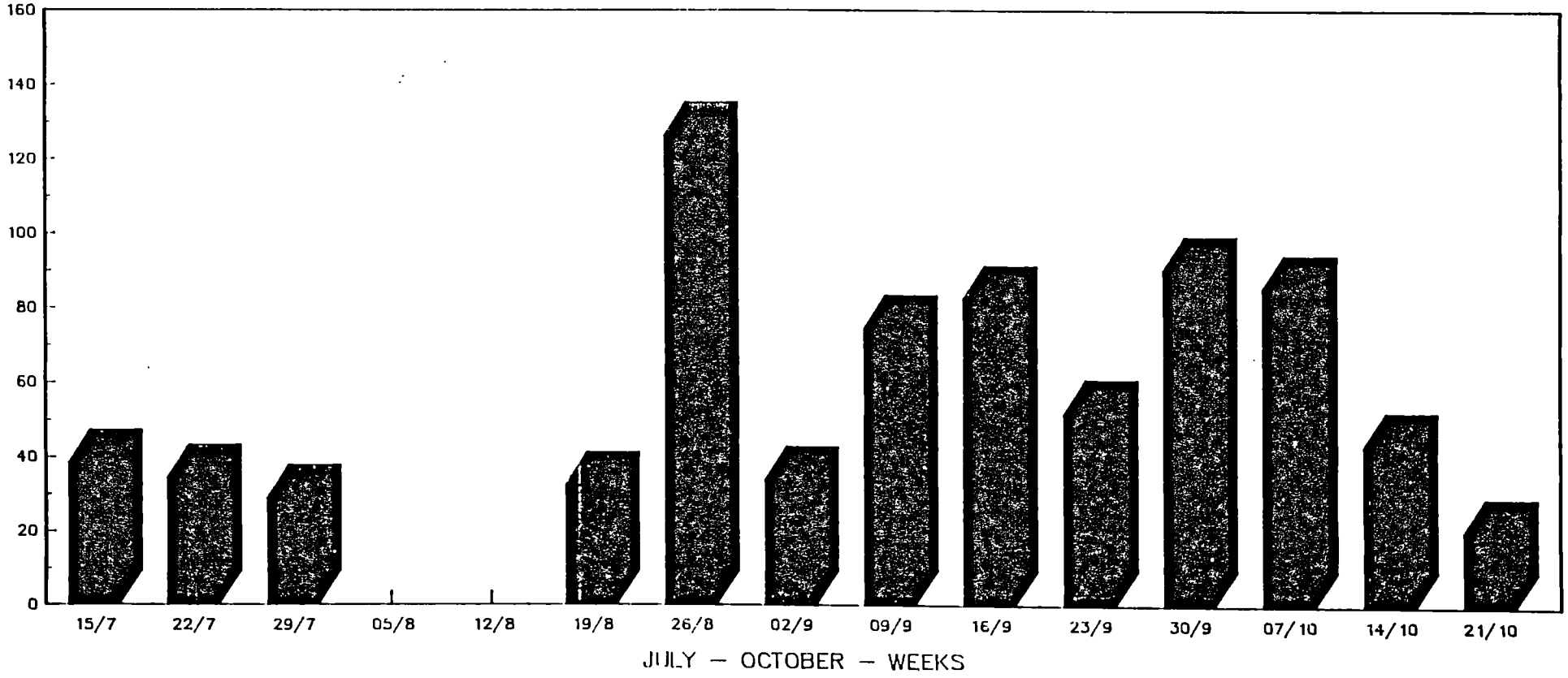
Run of Mine production time losses,
July - October, 1989

JULY – OCTOBER – WEEKS

IF YOU
HAVE ANY IDEAS TO REDUCE STOPPAGES
PLEASE DISCUSS THEM WITH THE ATS TEAM ON YOUR SHIFT

REMEMBER
THE TARGET IS TO REDUCE MONDAY TO FRIDAY STOPPAGES
TO 20 HOURS/WEEK

HOURS LOST/WEEK



CHAPTER SEVEN

CONCLUSION

1. INTRODUCTION

This concluding chapter begins with an assessment of the significance of the case study material and compares and contrasts the divergent patterns of restructuring in each case. The subsequent sections take up the themes outlined in Chapters Two and Three in the light of the empirical and conceptual arguments about the contemporary transformation of work which were presented in the earlier part of the thesis. Three broad conclusions are emphasised. Firstly, the value of analysing the present restructuring in terms of a transition from Fordism to post-Fordism is questioned, especially in relation to the supposed emergence of a new type of skilled work. Instead, the limited forms of the new competencies are emphasised and the potentials for intensification are stressed. Secondly, the notion that present restructuring is strongly biased towards the emergence of a 'post-conflictual' labour process is examined, both in the light of the evidence from coal, and at a broader conceptual level. It is suggested, instead, that inherited patterns of conflict and accommodation are crucial in determining trajectories of change. One conclusion arising from these discussions is that history and geography (and the interrelations between them) place important constraints on the direction of restructuring. A final look is taken at restructuring in Britain with

the aim of answering the question of whether Thatcherism was and is the only solution to the problems of British industry in general and the coal industry in particular. The possibilities of an alternative are sketched.

2. THE EVIDENCE OF THE CASE STUDIES

Contemporary workplace change in coalmining acted upon and, in many ways, deepened an older trajectory of change. The process of mechanisation in coalmining began in the inter-war period and intensified in the post-war period. Mechanisation eventually proceeded around the technology of powerloading (sometimes referred to as 'semi-continuous mining'). Although mechanisation did give rise to an increase in productivity this was not sustained. The attention of managers and engineers began to focus on discontinuities in the production process. The coal-getting process was subject to technical limits reflected in production delays. Simultaneously, managers were vexed by problems of alleged labour indiscipline. In part, management's labour concerns arose from the exercise of workplace job controls and, more generally, traditions of solidaristic workplace bargaining which reflected an ancient pattern of labour relations.

In the 1970s, a programme of technical change was initiated which had two complimentary features. On the one hand, the general principles of concentrating production on ever more mechanised longwall faces were deepened through the development and introduction of heavy duty mining equipment. On the other hand, microelectronic monitoring and

control technologies were developed and progressively introduced. The use of microelectronics was an attempt to overcome the proneness of the production process to interruption and to ensure a high rate of utilisation of new heavy duty faces. Given management's perception of the productivity problem as a problem of labour indiscipline, opportunities were taken in the development of the technology to build in an enhanced degree of managerial control over the production process.

The programme of technical change and productive expansion was concentrated in the central coalfield from the 1960s - a process which was intensified with development of heavy duty technology. It was in these coalfields that geological conditions, with coal lying in thick and unfolded seams, were thought to be best suited to the new forms of mechanised production. The heavy duty mechanisation process, therefore, did not have a major impact on the North East. Automation of some plant occurred but was of a limited kind and did not reflect the leading edge of change embodied in the ATM strategy (systems such as CIS-VAX were absent). A more limited pattern of technical change did underpin a gradual concentration of production on fewer faces, but the types of technology which might have helped the North East were not at the centre of the technical change strategy.

The paradox is that on the basis of this strategy the North East moved into profit. Productivity rose rapidly after the miners' strike but on the basis of an intensification of labour - an outcome engendered largely by a real and justified fear of pit closures on the part of the

workforce - rather than a programme of technical change around the principles of heavy duty mining. Productivity levels, however, remained low by national levels, reflecting the low level of investment in the coalfield. In turn, however, low levels of investment meant a low level of capital repayment charges and this laid the basis for short-term profitability, but did not lay the basis for long-term economic viability. Moreover, increased concentration of production on fewer faces sowed the seeds of future disaster by exacerbating the effects of production stoppages.

In many ways, Selby provides a striking contrast to the North East. Selby was designed to incorporate the new production principles of heavy duty mining equipment and advanced technology mining, which promised a highly integrated and automated production system. 'The Selby Concept' was conceived on a grand scale around optimistic assumptions about the geology of the coalfield and this was the origin of its later problem. Geological problems meant that the production process was subject to unexpected disruption. The impact of the delays was exacerbated by the capital-intensive and highly automated character of the production process: concentration of production on few faces - in Selby's case reflecting management's unshakable faith in the abilities of new technology - meant stoppages had an immediate and large effect on output. Output losses and high capital charges meant the financial performance of the complex was poor despite high levels of productivity.

Selby was developed around the pursuit of large scale production designed to give economies of scale. The ATM strategy was designed mainly to ensure high utilisation levels of this expensive plant. For various reasons, there was a strong tendency to attempt to incorporate skills into machinery and there is considerable evidence that where possible increased managerial control over the workforce made possible by microprocessor technology was designed into equipment. In some important cases, though, notably autosteering, the automation of human skills was only partially achieved. However, where space remained for the deployment of traditional skills, management and engineers tended to see the opportunity for further automation. Current research focuses on 'robotisation' of face activities:

> The 'robot' shearer will be programmed to cut a horizon, set by the machine attendant and lodged in a shearer gate computer. Once programmed the machine will perform each successive shear to the pre-set pattern and will only be changed thereafter should the machine attendant determine the need for correction to the programme...The ultimate aim is to work the coalface with one monitor-man in attendance at the face and a gateroad operative as his sentry, together with shift supervisor and maintenance (Brabbins, 1990: 301).

Although suggestions had been made in the earliest days of the planning of Selby that new types of labour would be required for the mine, in practice this seems to have been limited to the selection of a workforce with a moderate bargaining tradition, and even this waned after the strike. Management's attitude toward workforce and unions hardened after the strike. Given this underlying feature of management's attitude to its workforce, it is hardly surprising that the technical problems of the complex were added to by persistent labour problems, even after the defeat of the 1984/5 strike. Subsequent efforts to create a culture of cooperation in the battle for productivity

and quality were stymied because of the climate of conflict in industrial relations.

3. FORDISM, POST-FORDISM OR A FALSE DICHOTOMY?

The evidence from British coalmining does little to bolster the claims of those who identify the emergence of a new 'industrial paradigm' based on the widespread use of microelectronics in industrial processes and, instead, cautions against theorisations which emphasise sharp discontinuities in industrial practice. The post-Fordist thesis has tended to emphasise the emergence of a new industrial paradigm based on decentralised forms of production organisation and control. This industrial paradigm is underpinned by the potentialities of microelectronic technologies and the claim that these technologies reach their full economic potential when the autonomy of workers or groups of workers is guaranteed. As Elger (1990) has noted, however, such 'transformational' accounts and 'positive' accounts are buttressed more by the polemical and overdrawn contrasts they make than by a recognition of the complexity and equivocation of actual restructuring.

The conceptual discussion and the empirical evidence in this thesis suggests a different interpretation of the changes occurring in monopoly capitalism. The main direction in innovations in production control is toward further integration, arising from the time saving imperative expressed in Taylorism and Fordism. The main trend in technical change in large scale industry represents the pursuit of the optimisation of production time and the better management of the

production flow. The widespread use of information technology in production is aimed mainly at this end of improving the productive flow and reducing idle and unproductive time, thus increasing machine utilisation rates. However, this process is not underpinned by the use of microelectronics alone. Japanese manufacturers of mass produced standardised goods began the pursuit of this end before microelectronics were available on a large scale. Moreover, most commentators agree that Japanese industrial success owes more to the organisation of labour processes than to a particular technological system. The varied and uneven character of the pursuit of this end is captured by the idea that managements engage in the constant search for time and control economies, but that this has many forms and diverse outcomes.

The dominant pattern of change in skills and work practices tends to reflect management's interest in the integration of the production process, rather than the recreation of craft skills to meet differentiated demand. Growing capital intensity and integration of the production process increases managerial concern with machine utilisation and, at times, has led to limited, heavily circumscribed extensions of workplace autonomy to liberate creative aspects of workers abilities, in an effort to promote a concern among workers with optimising production processes.

These tendencies are highlighted in the case of coal. The mechanisation of longwall mining was an attempt to emulate a kind of Fordism. Although, the labour process in coalmining was built on the

legacy of a craft past, mechanisation gradually eroded the craft elements of the labour process, in effect establishing the real subordination of labour. In coal, though the use of scientific management was gradually extended, its actual application was mediated by pre-existing patterns of worker autonomy and job controls, which tended to be reformulated to meet the demands of mechanisation. Technical change in coal occurred on a large scale in the late 1970s and 1980s, but in ways which extended the principles of flow production and in ways which minimised human skills. Deepening capital intensity and the discontinuous nature of mining generated management's heightened concern with the wide application of microelectronics.

The recent technical change around the use of microelectronics is slowly altering the character of work in coalmining is ways which workers clearly understand. The nature of change is most clearly discernible in the case of maintenance work at Selby. A complex process of change revolves around the automation of key aspects of skilled work and the extension of limited competencies to previously semi-skilled workers. The prognostication for maintenance skills in mines organised around HDME/ATM principles appears to be for the emergence of new type of semi-skilled work. The human content of the maintenance process is less and less concerned with fault finding and diagnosis, which is subject to automation, and more emphasis is placed on rapid changes of faulty equipment, reflecting the general emphasis on ensuring the continuity of production. Selby itself might therefore be seen as a neo-Fordist (ie. only a limited departure from Fordist principles), rather than post-Fordist workplace. This pattern of change lays the

basis for an intensification of the labour process, along the lines suggested in Chapter Two, section six.

Intensification of some mining labour processes may be a function of new automated technologies, but, more generally reflected the altered balance of power between management and labour following the defeat of the miners' strike. This is evidenced by the fact that surveillance technologies existed in some pits prior to the strike without resulting in a productivity breakthrough. In the post-strike period such technologies, however, were used to facilitate a general tightening of work practices in the face of weakened unions. This raises a further conceptual point. Computerisation does not, as the IfS suggests, itself lead to the 'final subsumption of labour' (see Chapter Two). The subordination of labour is not guaranteed by superior forms of electronic information generation, but remains open and subject to contest and is a function of the prevailing balance of class forces.

4. CLASS CONFLICT AND INDUSTRIAL CHANGE

The evidence of this study suggests that industrial change remains a socially bargained and often contested process. In the case of coal the progress of restructuring owed far more to historically received patterns of interest determination and conflict and accommodation than any inherent properties of the technology. It is this factor which helps to accounts for a large measure of the unevenness which is embedded in the process of restructuring and which belies attempts to identify a new universal, 'post-Fordist' pattern of rationalisation.

Periods characterised by qualitative developments in the pattern of industrial restructuring, it seems, have tended to be characterised simultaneously by profound pessimism and unbridled optimism about about the potentialities of new technologies and forms of production neither of which, in my view, are justified. Around the time of the emergence of new forms of production based around the principles of scientific management and assembly lines - 'Fordism' - such a polarisation of view occurred. Clarke (1990) has shown how many contemporary critics of capitalist exploitation welcomed the arrival of Fordist forms of production as evidence of a ripening of the forces of production and a deepening socialisation of the relations of production. Gramsci and Lenin, for instance, believed that the immanent tendencies within the capitalist organisation of industry were essentially progressive. For revolutionaries of the period the task of politics was to create a social superstructure which reflected this development of the economic substructure. Nevertheless, for the communists of the inter-war period the process of social and economic change remained one which was characterised by conflicts arising from the different material interests of social groups involved in production.

In one crucial respect, then, the terrain of the present debates is significantly different to those which accompanied the emergence of Fordism. For the post-Fordist thesis, exemplified in the pronouncements of Marxism Today, the notion that the restructuring process is fundamentally conflict-ridden is abjured. Conflict only really matters at the margins of change, because restructuring occurs according to 'inescapable lines of tendency' (Hall, 1985). These lines

of tendency are defined, largely, by the properties of new technology which, in their very nature, propel new skill requirements. In this study, however, it has been seen that restructuring remains contested because new technologies are introduced by firms primarily to help in their struggle for competitive advantage, not in order to humanise the workplace. Clarke's conclusion, therefore, is validated:

> Post-Fordist technologies can no more liberate the working class than could the technology of Fordism because the working class is not exploited and oppressed by technology but by capitalism (Clarke, 1990: 150).

This point is further illustrated by the examination of the biases inscribed into the national patterns of restructuring in the UK, Japan and Germany. In the UK case restructuring has occurred in the context of a weakening of organised labour during the 1980s, a process exemplified by restructuring in the coal industry. In Japan, the competitively successful forms of industrial organisation are based on the structural weakness of Japanese company unionism, a weakness which reflects defeats suffered by radical trade unions in the period after 1945, which means there are few brakes on management's rationalisation efforts.

In the German case an opposite set of tendencies appear to be at work. While industrial modernisation, reflected in investment in advanced process technologies, has resulted in the emergence a high wage/high productivity virtuous circle in key areas of manufacturing, this does not reflect the benign features of the technology but the pattern of class conflict and accommodation which is embodied in the German system of industrial relations. The legal framework of German

industrial relations makes it difficult for firms there to lay off workers. Moreover, the co-determination of industrial relations through the works council system forces German employers to include the views of unions in planned rationalisation and modernisation. The productivity performance of the German economy and the extensively negotiated pattern of technical change largely reflect management's recognition of these constraints in their activities. German firms, therefore, are more likely to plan labour requirements over a long period. Also, German firms have responded to the constraints on their operations by moving into high value-added production. This becomes a virtuous circle as the firms gain lucrative and stable markets and this forms the basis for longer term planning of industrial change (Lane, 1987; Streeck, 1985)[1].

5. LIMITS OF THATCHERISM AND ALTERNATIVE POSSIBILITIES

> Men make their own history but they do not make it just as they please; they do not make it under circumstances chosen by themselves but under circumstances directly encountered, given and transmitted from the past. The tradition of all past generations weighs like a nightmare on the brain of the living (Marx, Eighteenth Brumaire of Louis Bonaparte, 1852)

I showed in Chapter Three how the debate about the supposed emergence of post-Fordism in Britain is bound up inextricably with the analysis of the impact of Thatcherism on British industrial performance. It was argued, though, that Thatcherism was not concerned with laying

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[1]This is not to argue that German workers and their unions do not face threats (see Chapter Two). In Chapter Two, for instance, I noted that the conflict over the reduction in working time was crucially related to the issue of technical change. My aim, rather, is to suggest that the legacy of historical patterns conflict and compromise in German industrial politics have provided unions with a basis for dealing with these challenges which British workers seem to lack.

the foundations of post-Fordist production but with a more limited reduction in the workplace power of trade unions, in which the rhetoric of flexibility figured prominently.

The argument that Thatcherism orchestrated and presided over a productivity miracle, therefore, rests on the idea that job controls represented a break on managerial prerogative which blighted the productivity performance of British industry - a view which was widely held in relation to nationalised sectors like coal. While there is plenty of evidence to suggest that Britain emerged over the post-war period as a low-investment/low productivity economy, there is little evidence that job controls themselves were the determining factor in this state of affairs. Nevertheless, this interpretation of the industrial problem has predominated and has been given added edge by the free market rhetoric of the Thatcher governments and their ideological supporters. Thatcherism can be seen as the apotheosis of this view of the 'British problem'.

In Britain during the 1980s there have been important changes in forms of work organisation, wage bargaining and payment systems. However, there is little evidence of any determinate link between these changes and the introduction of new technologies. Instead these changes tended to reflect the growing strength of management and the weakened position of labour in the prevailing recessionary conditions. In Britain the push for 'flexibility' in labour relations and workplace organisation has been concerned essentially with an intensification of labour on the basis of a shift in the balance of class forces in favour of capital.

The role of the state was important in this process. The state, and more especially the Thatcher governments, has been central promoting a particular view of the industrial problem as a problem of labour indiscipline and excessive trade union power. The state, moreover, through its promotion of a particular solution ('flexibility') to the productivity problems of British manufacturing, has sought to provide a 'demonstration effect' for private manufacturing. The state was able to become involved in determining the direction of restructuring in key parts of industrial production by virtue of its ownership of important industries.

The case of coal adds powerful supporting evidence for this argument. The state sanctioned significant investments in new production processes in the late-1970s to mitigate the previous run-down of the industry. The pattern of technical change established in the 1970s, exemplified by the Selby Concept, was characteristic of the investment choices made by other nationalised industries in the 1970s in capital-intensive, rigidly automated process technologies (cf. also the discussion of BL in chapter three) which can be contrasted, for instance, with the Japanese approach of low-cost modifications of existing processes. Moreover, this technological choice occurred just as the benefits of more flexible technologies were becoming apparent. The strategies of nationalised industries did not emphasise the 'fine tuning' of existing process technology which, at low cost, could have increased productive efficiency in general and machine utilisation in particular. Williams et al, (1986) argue that instead of choosing this latter approach British Coal chose to make rhetorical public statements about modern

manufacturing and bought in processes and plant which could not increase efficiency because they represented risky investment in inflexible production and placed their faith in computer monitoring to ensure high plant utilisation rates. The evidence presented in Chapters Five and Six certainly lends support to this argument. In the Selby case the large investment in a highly automated mine complex has been plagued by technical problems[2].

For Williams et al, the technical choices adopted by British Coal (and other nationalised companies) reflected an acceptance of orthodox assumptions about the economics of western mass production and the pursuit of economies of scale. This pursuit of scale economies was scuppered by the collapse in demand for coal. This argument warrants broad support on the evidence presented in this thesis, but there is more to it than this. In part, at least, the development of the technical choices of British Coal was an embodiment also of an obsession with labour control issues. Thus, while the overall motive behind the development of microelectronic-based monitoring systems was a general concern to minimise machine downtimes, where the opportunity presented itself, BC sought to marginalise the contribution of skilled labour to productive efficiency. As far back as 1973 Wilfrid Miron

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[2]The more piecemeal modernisation efforts in the North East brought the area into profit for the first time since nationalisation, although there is no evidence that this reflected a technological breakthrough and, more importantly did not lay the basis for sustained competitive success. Profitability reflected an absence of investment and in this way the North East coalfield might be seen as a metaphor for industrial restructuring in Britain during the 1980s.

stressed the opportunities which BC's investment programme presented for reducing the role and significance of human labour (especially NUM members) in the production process. Despite the evidence which suggests this strategy is flawed in efficiency terms, mining engineers persist with an approach based on the automation of everything.

Was this anti-labour bias inevitably inscribed into the pattern of restructuring of the 1970s and 1980s? Leys (1991) in a vigorous defence of the 'new times' thesis, has argued that Thatcherism was the only viable political solution to the crisis of the British economy by 1979 and that the subordination of labour was a necessary, though perhaps not sufficient, condition for economic growth. However, the very features of industrial organisation which are said to have inhibited British industrial development (ie, union 'interference' in production) might have provided the basis for an alternative model of restructuring.

In Chapter Three, I emphasised the positive aspects of job controls and and stressed their historical basis in ideas of craft: the commitment to standards of craftsmanship and the promotion of self-discipline among small groups. In many ways there are similarities between this form of work organisation and the types of flexible group working beloved of the new orthodoxy: both in a sense are forms of responsible autonomy. However, Edwards and Terry (1988) have pointed to some crucial differences. The British model of responsible autonomy was not a managerially inspired device: loyalty was to the craft and its standards, not to the firms as such. The whole climate was different: craftworkers take pride in their independence, whereas workers given

autonomy by firms are often enmeshed in a structure in which business needs are paramount and have little or no discretion in the deployment of their efforts. Paradoxically, management inspired autonomy can be an attempt to more fully subordinate workers to management - a process illustrated graphically by the Japanese example discussed in Chapter Two. For British firms though, with a short-term outlook and 'hire and fire' mentality, the independent forms of control exercised by their workers and their shop stewards were a hindrance to 'management's right to manage'.

Edwards and Terry, surveying the post-war development of industrial relations, suggest that reform of managements' limited perception of the industrial problem (and its practical manifestations in short termism) might have provided the means for developing the potentials of responsible autonomy that existed within the British tradition of job controls and craft practices. They argue, though, that the unions themselves would have needed to change. In particular, in exchange for job security unions would have had to offer flexibility across union demarcation lines. There was, in any event, a widespread recognition that many forms of demarcation were illogical and outmoded but it was a distrust of management which prevented them from being given up.

While recognising that managements have made significant changes in work organisation during the 1980s and shop stewards are less autonomous and assertive than they were hitherto, the evidence that the underlying character of British industrial relations has altered is hard to find. Workplace trade unionism, while weakened, has not been

wholly eradicated and the surge of industrial action in the late 1980s illustrated that where grievances existed and profitability was improved, workers would begin to reassert their interests. The pressing need to alter the zero-sum nature of British industrial relations remains. As Edwards and Terry note:

> ...initiating new forms of commitment is an expensive task, as resources have to be devoted to communication and training programmes, and also raises the problem of creating resentment and distrust. Although disinclined to do so, British managements might well gain by considering the sources of shopfloor order and pride in workmanship to be found in long established traditions (1988: 233).

6. WHAT FUTURE FOR COAL?

What possibility is there for this scenario to be adopted in the case of coal. The evidence from both Selby and the North East is not encouraging. In the North East, following the defeat of the strike, management launched a concerted offensive against job controls, although they presented no evidence that these were a hindrance on productivity improvement. The operation of job controls in the North East reflected more a concern with developed notions of fairness in the distribution of earnings, working conditions and career progression. Such job controls, however, did underpin traditions of solidaristic workplace activity and, for management, they came to be seen as something to eradicate, rather than something to build on.

Automation of skills seems central to the technical system at Selby. Trist and Bamforth in their study of the emergence of mechanised longwall mining suggested that, despite the erosion of the traditional hewing skills, a particular 'mining skill' still existed:

> But the specifically mining skill of contending with underground conditions and of maintaining a high level of performance when difficulties arise, is developed only as a result of several years of experience at the coalface. A work system basically appropriate to the underground situation requires to have built into the organisation situation the findings of this experience (1951: 23)

The development of systems such as SHEARER and MIDAS are explicit attempts to incorporate this knowledge into machinery, although the case of Selby suggests the technical difficulties of achieving this. At Selby there were attempts also to incorporate workers' knowledge of production process into the competitive effort. However, this attempt to engage workers into a more positive attitude toward production was not bargained, but imposed on management's terms. Moreover, this approach was introduced alongside the continued arbitrary exercise of management power and tended to be marginal to management strategy. There was no attempt by management to forge a genuine accommodation with the unions or workforce of the type which the post-Fordist thesis would deem necessary to operate such a capital-intensive production unit. Quite the opposite occurred: the subordination of labour was seen as a precondition of the successful operation of the mine. This attitude underpinned the labour relations difficulties of the post-strike period.

The examples of both the North East and Selby illustrate that the production process in coal remains subject to the kinds of interruption identified by Trist and Bamforth. Yet the development of a form of work organisation which might elicit creative and positive responses from the workforce in the face of such interruptions has eluded management. 'Cooperation' has been sought wholly on management's

terms and has been impelled by the threat of job loss due to BC's deteriorating market position. These forms of 'cooperation' are coerced.

A further constraint on the pattern of contemporary restructuring and which militates against the development of the alternative model advocated by Edwards and Terry, is the deteriorating market position of British Coal. Many mines are characterised by demoralisation among workforce and management and the onset of a 'redundancy culture', borne of the very real threat of closure hanging over a large part of BC's production. The are two components to the changing market position of British Coal, although both arise from the recent privatisation of the electricity supply industry and the concern of the privatised utilities to increase their imports of coal. These are described below, although amidst the gloom there are some rays of hope.

The newly privatised electricity utilities, National Power and Powergen, are committed to the expansion of imports principally on grounds of costs. According to a report prepared for the Coalfield Communities Campaign only about half of BC's pits can compare on price terms with foreign competition. The report suggests a worst case scenario of imports of 43mtpa which would mean a loss of 47,000 jobs and £1.5b increase in UK imports. The most immediate threat is to the traditional markets of the North East coalfield, the Thameside power stations (see Chapter Five). A further threat comes from the generators' decision to purchase low-sulphur coal - in order to meet new EC emission

guidelines - despite the fact that Britain is a world leader in clean coal technology.

If there are powerful economic and ecological arguments for retaining a domestic coal industry, there are also a few rays of hope for BC. Those that do exist include: potential action by the European Commission over imports and subsidies; the future activities of a non-Conservative government which, in part, will be determined by the actions of the Commission and; the possible expansion of small scale power generation by local authorities in coal producing areas.

A possible EC ruling against dumping of non-Community coal in Europe and the Commission's reported desire to create an intra-Community energy market in order to guarantee security of supply might allow an incoming non-Conservative government some room for manoeuvre to protect remaining mining jobs. The argument that subsidies are necessary to protect the remaining mining capacity - and that this end is desirable - is widely held and was recently advanced by the Conservative-dominated House of Commons Energy Committee. In a recent report they argued that the short term interests of the new generating companies should not be allowed to threaten the future of UK reserves and and long-term interest of electricity consumers (Financial Times, 18.7.91).

Even in the event of these developments transpiring the North East's southern markets remain vulnerable (see Chapter Five). Here again, though, there is some hope centred on the creation of a Tyneside

Energy Park at Howdon. This plan is for an environmentally dedicated business park, the centre-piece of which would be a combined heat and power station and district heating network. Initially, a gas-fired power station was proposed for the site, but recognition of likely prices rises and an appreciation of the potential of clean coal technology led the development consortium (the leading player in which is North Tyneside Council) to opt for a coal-fired power station. Research by the NUM suggested that given the site location was 3 miles from Westoe colliery in South Shields, a coal water mixture could be pumped along a pipeline to the proposed CHP station. The regionally indigenous source of fuel and the projected life of the colliery (35 years) would ensure security of supply and low transport and handling costs. Anticipated fuel preparation costs would be low, as run-of-mine shearer smalls could be mixed with washery froth flotation fines, much of which currently is dumped in the North Sea. The proposed business park is intended to be a example of good practice in energy efficiency and general environmental management.

Electricity from the plant would be distributed through the grid to regional users, while 'waste' heat would be used to provide process heat for industrial users on the site and district heating for nearby communities, many of which are characterised by high levels of social deprivation. Bed wastes and ash would be used by a materials construction plant on the same site. The proposal amounts to an energy-led economic regeneration project fuelled by an indigenous resource which would assist the North East to become energy self-sufficient. Instead of supplying southern power stations, jobs

would be secured by the creation of a regional energy market. The NUM argues that, unwittingly, the government's regulatory framework for electricity privatisation has opened up a space and created an incentive for local authorities to become electricity generators and in the process recapture parts of energy production for the public sector. The idea is for a local authority led energy utility which might include the NUM branch on its management body and investment from the Mineworkers Pension Fund. In short, it is a practical expression of the type of strategy advocated by Edwards and Terry.

The example of the proposed municipal power station (and its possible successor) is a small one, but it illustrates arguments of wider significance. It shows that an alternative model of industrial development could exist in Britain and illustrates the severe limits of the present strategy based on the unilateral assertion of management control. An alternative model would recognise and build on the positive contribution which workers can make by virtue of their knowledge and experience. In the particular case outlined above it is the NUM itself which has actively sought out the potential market and developed the outlines of the production system necessary to meet its needs - in effect doing the job of BC's marketing department. In this case the autonomous activities of the union, far from acting as break on the prerogatives of management, may actually prove to be the saviour of the pit. In the process it might also have revealed how a different type of post-Fordism might emerge, in which the positive contribution of workers to meet pressing needs in their communities, is genuinely acknowledged.

APPENDIX ONE

METHOD

1. INTRODUCTION

> In a letter to his friend Sir Richard Rees, some forty years ago, George Orwell mused on this curious British obsession with lack of bias or objectivity as an asset in politics or journalism. He wrote that pretty well anyone who writes anything about current affairs is almost certain to be biased in one direction or another. The way to deal with this was not, he said, to try to cut out opinions or bias, but to admit them. Those who were frank about where they stood on the whole wrote more honestly and informatively than those who pretended to be objective when in truth they were not objective at all. The real credibility test, it seems to me, is not in the political bias of a story, but in the accuracy and sweep of the information it conveys.
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> (Paul Foot, Words as Weapons, p91).

The aim of this appendix is to outline the process by which the research reported in this thesis was conducted and to describe some of the problems encountered. The discussion commences by outlining the constraints which are placed on a study such as this by the current form of doctoral training and the system of funding of doctoral work. Such constraints have a strong bearing on the nature and quality of contemporary doctoral work yet are rarely discussed openly in methodological appendices. I attempt to show that the character of this thesis and the research on which it is based were affected significantly by the existence of these constraints. I argue that there were particular problems involved in conducting research into work-related issues in the coal industry in the late 1980s. This meant that the

classic studies conducted in the industry in the 1950s and 1960s provided few clues as to how to proceed in the conduct of fieldwork. Some problems of conducting research in the coal industry in the post-strike period are outlined and the means by which I attempted to overcome these. The appendix explains the choice of the North East and Selby as case-studies. Finally, I outline the actual conduct of the case-studies. It is not my intention in this appendix to contribute to great issues of method, but rather to offer an account of the conduct of the research.

2. LIMITS TO DOCTORAL RESEARCH

The doctoral research on which this thesis is based was funded for three years through a studentship from Economic and Social Research Council's (ESRC) Programme on Information and Communications Technology (PICT). I received funding for three years, six months of which was a taught course reflecting the ESRC's new found concern with formal research training, through Centre for Urban and Regional Development Studies' Doctoral Programme on the Social and Economic Impact of Information and Communications Technologies.

Under the present funding system, PhD students are given three years grant, but four years in which to complete their thesis before the host department is penalised under the ESRC's rules on completion rates. Although the ESRC appears to work on the assumption that doctoral research will take four years to complete, it offers no suggestions as to how the inevitable funding gap implied by this system, be filled. In

addition, the growing importance attached to research training tends to mean that the three year period for research is significantly reduced. The fourth year tends to become an integral part of the doctoral study period, yet for many students all or part of this period is experienced as one of acute financial difficulties.[1]

The level of research funding is a further problem. The level of postgraduate grant is little incentive to undertake doctoral work, especially for students are not the stereotypical 21 year old with few financial commitments. Perhaps the low level of grant is designed to act as stimulus to early completion, although in practice it serves to exacerbate overall financial difficulties of doing doctoral work. In addition to the inadequate level of grant another real constraint on the research was the financial resources provided by the ESRC for fieldwork (and conference attendance) purposes, which amounted to £300 per annum. In practice, like most PhD students I know, I have in effect subsidised the ESRC by not re-claiming the full cost of fieldwork expenses.

The funding system also gives rise to important time constraints. Firstly, there is an effective limit of four years on ESRC funded PhDs a pressure felt keenly by departments and transmitted to their students. While in the past there was, in effect, no time limit on the

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[1]The Winfield Report on the future of the social science PhD argued in 1987 that, where doctoral programmes have been approved, the ESRC should provide four years of funding for students (Winfield, 1987: 129). Such a system has yet to instituted.

completion of PhDs, now this is not the case, and this has had an bearing on the nature of this study. For instance I intended to conduct a greater number of case studies. I abandoned this idea due to time considerations (and for financial reasons). The research design of this study was crucially influenced by a desire to be as near to completion as possible by the end of the third year of funding.

These time constraints and financial factors placed limits on the research. Within these constraints some fairly clear calculations had to be made about what could be achieved. There are a series of inconsistencies in funding which cloud the expectations surrounding contemporary doctoral work. Although this is the context for much doctoral work in the social sciences it is rare to see it discussed openly in methodological sections of theses. My reason for raising these concerns here is that current PhD funding places constraints on what can be achieved and that these need to be recognised, not least by the ESRC.

3. CHOICE OF CASE STUDIES

In particular the time-based and financial constraints outlined above placed limits on choice of case-studies. My aim was to contrast change in capital intensive mines with more labour intensive ones. Given this broad concern I originally proposed to compare mines in several coalfields but was forced to abandon this approach for the reasons just outlined. In the end I elected to compare the North East and Selby.

The North East was an obvious choice as a case study of an under-capitalised coalfield. First, it was on my doorstep. This meant it was convenient and, importantly, was cheap to research (see section 2). In addition, the North East is my home region and I knew something about its history which, to a large degree, is the history of coalmining. It was easy for me to establish contacts in the industry, which speeded up the process of acclimatisation.

I elected to contrast the North East with Selby. Selby represented the culmination of the trajectory of technical change established in the 1970s and seemed an appropriate selection given the contrast I was seeking to draw. Practical considerations cemented the choice of Selby. Firstly, it is the next nearest coalfield to the North East. This meant that it was possible to get to Selby and back in a day comfortably, allowing the possibility of saving fieldwork expenses. In addition Jonathan Winterton of Bradford University, who had carried out research and written widely on the Yorkshire coalfield, was interested in developments in Selby and proposed some joint interviews with miners. Winterton had extensive contacts among union branches in Yorkshire and the proposal of joint interviews was attractive in that it saved the time consuming process of establishing my own contacts. Some of the interview material on which Chapter Six is partly based is derived from these interviews[2].

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[2]I had intended to compare the automation in coalmining at Selby, with technical change at other capital intensive, but older mines, I abandoned this idea. The process of establishing contacts at Selby was
(Footnote Continued)

4. RESEARCH IN COAL: THE CLASSIC STUDIES

In approaching the question of how to conduct these case studies I consulted the classic studies of work in the coal industry. However, I quickly concluded that none of the approaches adopted in the famous studies of the coal industry conducted during the early period of nationalisation seemed feasible in the context of the 1980s and within the constraints under which my research was conducted.

The first of these studies (eg. Trist and Bamforth, 1951; Trist et al, 1963) examined the impact of technical change on work in the coal industry in the 1950s for the Tavistock Institute. The study was conducted over 10 years largely at one, anonymous pit in north west Durham (later identified as Chopwell) with follow up studies in the 1960s. In part, these studies were conducted for the NCB and, in the heyday of nationalisation, involved the research team observing miners' work. Although of much interest because of its findings, the scale of this research, the time frame in which it was conducted and the extensive personnel resources on which it was based meant that it provided few ideas of how to conduct research in more constrained circumstances. In addition, the type of cooperation from management and labour upon which its was founded, were unlikely to be reproduced

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(Footnote Continued)
slow and I had no reason to believe it would not be the same or worse elsewhere. In fact I did intend to contrast Selby with mines in Nottingham where the UDM was the majority union. Although this contrast would have helped to highlight the uneven pace of change, the problems of organising this case study would have been great.

in the late 1980s (see below). This type of study was out of the question in the 1980s (cf. Campbell's [1985] attempt to 'update' the work of Trist et al).

The classical 'anthropological' study of 'Ashton' (later identified as Featherstone) conducted by Dennis et al (1955) in the 1950s involved one of the researchers actually being employed as a miner for a period and living in the community he was studying. This study remains in many ways unrivalled and generated a rich knowledge of one pit and its community. The study, however, was conducted over several years and in a period when it was possible for a social scientist to be employed at a pit as a datal hand and to be a regular participant at union meetings. Again, there was little chance of replicating this research strategy.

Kreiger's (1983) study of changing wages systems in the coal industry, conducted in the mid-1970s, offered a more likely template for the conduct of my case studies. Krieger examined the impact of the introduction of the NPLA through a comparison of five named pits in Durham and Nottinghamshire. In this study, the author appeared to spend one day in each colliery conducting interviews with key actors in management and Lodge or branch officials, in an attempt to grasp their particular 'anthropologies'. In addition, Krieger was allowed unlimited access to the relevant files at pit level and nationally. Although this approach was the one I was most likely to emulate, by no means would it be possible to adopt this approach unproblematically in the late 1980s. In particular, the level of joint cooperation from management

and labour was unlikely to be forthcoming in the charged post-strike atmosphere.

The nature of studies just outlined owed much to the political climate of the period in which they were conducted. In the heyday of the nationalisation period it appears there was an atmosphere which appeared to be conducive to these studies. On the one hand, the adoption of a 'productionist' and increasingly 'scientific' outlook by management, it appears, made them open to the investigations of social scientists. On the other hand, unions also appear to have accepted willingly the presence of researchers underground. However, certainly by the late 1960s, this situation was beginning to change. When researchers from the Tavistock Institute carried out a study in the Yorkshire coalfield in 1969/70 they found that the climate of industrial relations and the mechanised mining process itself precluded the possibility of extensive underground observation of the type they had used in Durham in the 1950s (Murray and Spink, 1979). Similarly, when Edwards and Heery (1989) studied the introduction of incentives in the late 1970s, although they secured extensive cooperation from management, they found themselves excluded from pits in Yorkshire.

Given the limits on the study it was pointless attempting to emulate the large scale studies of the 1950s and 1960s because I lacked the resources (eg. armies of research assistants) and because circumstances had changed (the period of relative union-management consensus characteristic of much of the post-war period had disintegrated).

Similarly, for technical and political reasons the type of research pioneered in the post-war period would be inappropriate

5. RESEARCH IN COAL IN THE 1980s

In their study of restructuring at Cadbury's, Smith et al (1990) describe how they secured total cooperation of management. As a consequence they were able to construct a real history of organisational change rather than invent a 'semi-fictional 'choc co.' whose disguised identity would immediately limit the interpretation and quality of the research findings' (xv). They argue that management cooperation in the research enterprise improves the quality of research as social scientists do not have to guard against every comment or internalise self-censorship in order to secure access necessary to produce critical empirical analysis of real experience of organisational change and transition. The alternative, they argue, is to obtain data which cannot be used:

> Such data, and therefore the research which relies on them, can make no useful contribution to knowledge, and social scientists are fooling themselves by agreeing to such stringent controls on their action in exchange for access (Smith et al, 1990: xv).

This may or may not be true, but raises the question of how to proceed with research in organisations without the sanction of management in the context of the 1980s. Informal contacts with coal industry experts and with managers made it clear that I could expect only limited forms of cooperation from management, who would have little time and would be suspicious about any research in the field of labour relations. On

the other hand, management positions, at a general level, were set out clearly in the engineering literature in the late 1980s.

Doctoral studies of the coal industry conducted during the 1980s highlighted the difficulties even further. Campbell's (1985) study, in inspiration at least, is concerned with the introduction of information technology in the coal industry and its impact on industrial relations. Campbell reports that he began his study with the intention of 'updating' the 10 year Tavistock Institute study (Trist et al, 1963) described in section 4, in the light of the introduction of systems such as MINOS. However, the industrial relations aspects of the study proved too controversial to secure the cooperation of the NCB which would have been necessary to implement the underground observation of face work, especially following the publication of the Bradford Group's original study (Burns et al, 1985) and the onset of the miners' strike. Campbell instead turned his attention to the impact of monitoring technologies on the work of deputies, hoping to test the thesis that microelectronics was eliminating supervisory work (see Campbell, 1985: chapter 4). This idea was also rejected by management because NACODS might fear it was an exercise in method study. Eventually, Campbell reports that he settled for a study of the changing relations between management departments in the light of technical change. This final study is a long way from the originally proposed one, and serves to highlight some of the political difficulties of conducting research in the coal industry[3].

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[3]In fact Campbell's study reveals the difficulty in securing
(Footnote Continued)

An alternative approach was that of Renouf (1990). Renouf's main concern is with the role of union branches in the crisis of the coal industry in the 1980s through a study of conflicts at Murton colliery in County Durham. Renouf's study is an almost anthropological one based on long term contact with past and present key actors in the union branches. This approach was supplemented by a few approaches to management. Using this approach Renouf was able to construct an impressively detailed account of change at Murton. Renouf's decision to approach his research question through the experience of the union side reflected also his political sympathies, but was born mainly of a recognition that in the context of the post-strike period it was necessary to choose a 'principal route' into the industry (a recognition shared, in a way, by Campbell).

In this light, I elected to pursue a strategy whereby my 'principle route' into the coal industry would be through the union side. This was necessary given my interest in questions of work and class conflict. My 'picture' of the nature of change and prevailing balance of forces between management and labour at particular collieries is therefore influenced by this choice. I assumed that I would have only limited opportunities to speak to pit-level management and for this reason my approaches to management would be sparing.

(Footnote Continued)
management cooperation for a study of coal with industrial relations implications. Campbell, by his own account, seemed more concerned with securing management cooperation than with substantive questions.

6. THE CONDUCT OF THE CASE STUDIES

My initial understanding of events in the North East and Selby was drawn therefore from contacts with union officials. Later I approached management with specific sets of questions which arose both from the review of the engineering, historical and other literature and the preliminary discussions with union officials at pit level. This allowed me to minimise my demands on management time, which increased the chances of cooperation and reduced the chances of this aspect of the research being scuppered by my discussions with the unions being exposed.

The statistical data which form part of the case studies had various origins. Discussions with management produced only limited forms of data. In the case of the North East my major source of statistical data proved to be the NUM and NACODS who made available Area level production data which the union obtained from Area consultative committees. Part of this included detailed technical data for 1981/2-1987/8. These form the basis of some of the figures in Chapter Five. Unfortunately, this data series was discontinued after this date. The provision of this data was completely fortuitous and reflected an act of goodwill on the part of NUM area officials. It stands, perhaps, as a testament to the role of luck in academic research.

Paradoxically, obtaining statistical data on the performance of Selby proved less difficult. It might be assumed that with such a new production facility it might prove difficult to obtain detailed

quantification of its performance. This was not the case. This is explained by at least two facts. Firstly, the performance of the Selby complex has been covered regularly in the press and in the engineering literature. In the course of these articles much interesting data has been produced some of which is discussed in Chapter Six. In addition, management plans and aspirations are spelled out in detail in the publications used by management in their extensive direct communications effort. For instance, one of these publications, 'Gascoigne Wood News and Views', provides regular information on the running times of the main coal clearance systems, data reproduced in Chapter Six. Also, management's hopes for autosteering, ATS, and so on were covered in detail in these internal publications.[4]

The source of more qualitative evidence on the pattern of change came from discussions with key actors at Area and pit level. In the North East case, two in-depth studies of change at Westoe and Wearmouth pits were conducted. The discussions at pit level were conducted with branch officials (the equivalent of shop stewards) and management. This means that the data has an 'activist' bias. However, within this bias a range of opinions were offered. In each case, in addition to discussions with DMA and DCMA branch officials, discussions took place with NACODS officials and, in the case of Wearmouth, discussions were

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[4]In addition, I received some data privately which while extremely useful and which informed the background discussions in Chapter Six, unfortunately I was unable to use because they were supplied on a confidential basis. For instance, I received data on a private basis from CIS-VAX monitoring from a member of management which although confirming some of my hypotheses I was unable to use directly.

held with officials of the UDM, who offered a distinctive perspective on the nature of change at the pit. The discussions with a range of key actors at the two case-study pits were supplemented by less systematic discussion with key actors at other pits, in order to situate Westoe and Wearmouth in the context of the North East, and in order to allow me to make generalisations about the coalfield as a whole.

In the case of Wearmouth and Westoe, valuable data was obtained from presentations given by the respective colliery managers to the North of England Institute of Mining and Mechanical Engineers at Newcastle, which I attended. This forum proved a valuable means to gauge management opinion in the coalfield more generally. Data from papers presented at the Institute are included in Chapter Four. I also paid an underground visit to Westoe colliery which lasted for one morning. Although this was wholly inadequate as an experience on which to base anything but the most superficial generalisations about technology and mining systems, the discussions held with junior management and face supervisors in their work situations that day proved highly illuminating. (Attempts to secure an underground visit at Wearmouth proved unsuccessful). The main advantage of the visit was to allow me to make a general comparison between a North East pit and the Selby complex.

At Selby I made separate underground visits to both Riccall and Stillingfleet. The first at the beginning of the research and the second near the end. Although such visits provide only a snapshot picture, they did serve to contrast the large scale and the newness of Selby

with the more antiquated feel of the North East. At Selby contacts with management were more limited than in the North East - there was no local equivalent of the Institute of Mining Engineers - and were limited to one-off discussions. However, Selby Group management did provide specially some useful data which is included in Chapter Six, along with data derived from engineering and other sources. In the Selby case the more limited contact with management was more than compensated for by the extensive coverage of the mine's development in the engineering literature and through a review of internal communication literature.

Contact with the Selby unions was facilitated initially through Jonathan Winterton of Bradford University. In addition, discussions were held with miners from the complex who attended the Leeds University day release course. Subsequently discussions were conducted with branch officials on a series of day visits to Selby. The absence of separate unions for miners and craftworkers in Yorkshire, meant that particular care was taken to include the views of all grades. In the case of the North East and Selby much information was gleaned in highly informal situations (usually pubs). While such information was invaluable and helped to inform the background to reports of the case studies in Chapters Five and Six, the extended quotes in the text come only from taped interviews with key actors (some thirty individuals in all) - unless otherwise stated.

BIBLIOGRAPHY

Abernathy W.J., Clark K., Kantrow A., (1983), Industrial Renaissance: producing a competitive future for America. New York: Basic Books.

Adeney A., Lloyd J., (1986) Loss without Limit: the 1984/5 miners' strike. London; Routledge and Kegan Paul.

Aglietta M., (1979), A Theory of Capitalist Regulation: the US experience. London: New Left Books.

Aguren S., Bredbacka C., Hansson R., Ihregren K., Karlsson K., (1985), Volvo Kalmar Revisited. Stockholm: Efficiency and Participation Development Council (SAF, LO, PTK).

Alford B.W.E., (1988), British Economic Performance, 1945-1975. London: MacMillan.

Allen V.L., (1981), The Militancy of British Miners. Shipley: The Moor Press.

Altmann N., Dull K., (1990), 'Rationalization and participation: implementation of new technologies and the problems of the works councils in the FRG', Economic and Industrial Democracy, 11, 1, pp111-27.

Amin A., (1985), 'Restructuring in Fiat and the decentralisation of production into southern Italy', in R. Hudson and J. Lewis, (eds) Uneven Development in Southern Europe. London: Methuen

Amin A., (1989) 'Flexible specialisation and small firms in Italy: myths and realities', Antipode, 21, 1, pp13-34.

Amin A., Dietrich M., (1990), 'From hierarchy to 'hierarcy': the dynamics of contemporary corporate restructuring in Europe', paper to the annual conference of the European Association of Evolutionary Political Economy, Hotel Montebello, Florence, 15-17 November.

Amin A., Robins K., (1990), 'The re-emergence of regional economies? the mythical geography of flexible accumulation', Environment and Planning D: Society and Space, 8, 7-35.

Amin A., Tomaney A., (1991), 'Creating an enterprise culture in the North East? the impact of urban and regional policies of the 1980s', Regional Studies, 25 (5), pp479-487.

Anderson F., Thorpe R., (1967), 'A century of coalface mechanisation', Mining Engineer August, pp775 - 785.

Anglo American Council on Productivity, (1951), Report on Coal. London: AACP.

Aoki A., (1984), 'Aspects of the Japanese firm', in idem. (ed) The Economic Analysis of the Japanese firm. Amsterdam: Elsevier Science Publishers.

Aoki A., (1987), 'The Japanese firm in transition', in K. Yamamura, Y. Yasuda (eds) The Political Economy of Japan. Volume 1: the domestic transformation. Stanford, Ca: Stanford University Press.

Aoki A., (1990), 'A new paradigm of work organization and coordination? Lessons from the Japanese experience', in S. Marglin, J. Schor, (eds) The Golden Age of Capitalism. Oxford: Clarendon Press.

Archibald D., (1988), 'Undersea mining in the northeast of England', Coal, April, (Special supplement: British Technology in Mining), pp22-27.

Ashton D., Green F., Hoskins M., (1989), 'The training system of British capitalism: changes and prospects', in F. Green (ed) The Restructuring of the UK Economy. London: Harvester/ Wheatsheaf.

Ashworth W., (1986), The History of the British Coal Industry. Volume 5: 1946 - 1982: the Nationalised Industry. Oxford: Clarendon Press.

Auer P., (1985), 'Industrial Relations, work organisation and new technology: the Volvo case', Discussion Paper LLM/LMP 85 - 10, Berlin: Wissenschaftszentrum.

Austrin T., Beynon H., (1981), 'Masters and Servants: paternalism, and its legacy on the Durham coalfield: 1800-1872', working paper, Department of Sociology, University of Durham.

Badham J., Mathews J., (1989), 'The new production systems debate', Labour and Industry, 2, 2, pp194-246.

Bailey R., (1991), 'Energy policy in confusion', National Westminster Quarterly Review, February, pp17-28.

Baldwin G.B., (1955), Beyond Nationalisation: the Labour problems of British Coal. Cambridge Ma: Harvard University Press.

Barbrook R., (1990), 'Mistranslations: Lipietz in Paris and London', Science as Culture, 8, pp80-117.

Barrett P., (1988), 'British boost longwall efficiency through monitoring and control', Coal, June, pp44-47.

Bassett P., (1986), Strike Free. London: MacMillan.

Bates J., (1981), 'In built machine performance and condition testing - IMPACT' Mining Engineer July, pp31-37.

Bean C., Symons J., (1989), 'Ten years of Mrs T', unpublished paper, Centre for Labour Economics, London School of Economics.

Belussi F., (1987), 'Benetton: information technology in production and distribution: a case study of the innovative potential sectors', Occasional Paper 25, Brighton: SPRU, University of Sussex.

Benz-Overhage K., Brandt G., Papadimitriou Z., (1982) 'Computertechnologien in industriellen Arbeitsprozess', in G. Schmidt et al (eds) Materialen zur Industriesoziologie. (Sonderheft 24/1982 der Zeitschrift fur Soziologie und Sozialpsycologie, Opladen), pp84-104.

Berrgren C., (1989), 'New production concepts' in final assembly - the Swedish experience', in S. Wood (ed) The Transformation of Work?. London: Urwin Hyman.

Beynon H., (1985), Digging Deeper: issues in the miners' strike. London: Verso

Beynon H., Hudson R., Sadler D., (1990), A Tale of Two Industries: the contraction of coal and steel in the North East of England. Milton Keynes: Open University Press.

Bohen J., Wroughton N., (1988), 'High-tech mining and the new model miner', Science as Culture, 2, pp91-106.

Boyer R., (1987), 'Labour flexibilities: many forms, uncertain effects', Labour and Society, 12, 1, pp107-129.

Brabbins M. W., (1991), 'A decade of roof support progress', Mining Engineer, March, pp295-301.

Bradshaw S., (1985), 'The impact of high technology on the politics of mining', The Listener, 25th April, pp2-4.

Brandt G., (1986) 'Technological change, labour market change, and trade union policy', in O. Jacobi et al. (eds) Technological Change, Rationalisation and Industrial Relations. London: Croom Helm.

Braverman H., (1974), Labour and Monopoly Capitalism. New York: Monthly Review Press.

BC (various years) Annual Reports and Accounts, London: British Coal.

Brown W., Wadhwani S., (1990), ' The economic effects of industrial relations legislation since 1979', National Institute Economic Review, 131, pp57-69.

Buck J.D., (1989), 'Maximising coal clearance efficiency for the Selby coalfield', Mining Technology, April, pp 99-102.

Bugler J., (1976), 'Selby - the community', in R Vielvoye et al. Coal: Technology for Britain's Future. London: MacMillan.

Burns A., Newby M., Winterton J., (1985), 'The restructuring of the British coal industry', Cambridge Journal of Economics, 9, pp93-110.

Callinicos A., Simon M., (1985) The Great Strike. London: Socialist Workers Party.

Campbell A., (1985), 'Technological change and management in the British coal industry', PhD thesis, Brunel University.

Campbell I., (1989), 'New production concepts? The West German debates on restructuring', Labour and Industry, 2 (2) pp 247-280.

Cavestro W., (1989), 'Automation, new technology and work content', in S. Wood (ed) The Transformation of Work?. London: Unwin Hyman.

Chambers P.A., (1988), 'Free Steered Vehicle Applications in British Coal', Mine & Quarry, May, pp22-28.

Chandler K., (1978), 'MINOS - a system for central control at collieries', 2nd International Conference on Centralised Control Systems. London: Institution of Electrical Engineers.

Clarke S., (1989a), Keynesianism, Monetarism and the Crisis of the State. Aldershot: Edward Elgar.

Clarke S., (1989b), 'Overaccumulation, class struggle and the regulation approach', Capital and Class, 36, pp59-93.

Clarke S., (1990), 'New utopias for old: Fordist dreams and post-Fordist fantasies', Capial and Class, 42, pp131-155.

Cleary J., (1981), 'FIDO at Bold Colliery', Mining Engineer Nov.

Coates K., (1974), Democracy in the mines. Nottingham: Spokesman

Communist Party, (1989), Manifesto for New Times. London: CPGB.

Coriat B., (1979), L'Ateliere le Chronométrè. Paris: Bourgeois.

Coriat B., (1980), 'The restructuring of the assembly line: a new economy of time and control', Capital and Class, 11, pp34-43.

Coriat B., (1981), 'L'atelier Fordien automatise', Non!, November/December, pp90-101.

Coriat B., (1984), 'Labour and capital in the crisis: France 1966-82', in M Kesselman (ed) The French Workers Movement: Econonmic Crisis and Political Change. Boston: Allen and Urwin.

Coriat B., (1987), 'Information technologies, productivity and new job content - skill as a competitive issue', Paper presented to the BRIE meeting on comparative productions, Berkeley, 11-13th Sept.

Cox A., (1987), 'Future strategies for coal in the United Kingdom', PhD Thesis, University of Newcastle.

Crafts N., (1988), 'The assessment: British economic growth over the long run', Oxford Review of Economic Policy, 4, 1, pp1-21.

Cross M., (1885), Towards the Flexible Craftsman. London: Technical Change Centre.

Cusumano M., (1984), The Japanese Automobile Industry. Cambridge, Ma: Harvard Univ Press.

Cutts A., Jarvis E., (1987), 'Improving maintenance and reliability by condition monitoring' Mining Technology, June, pp363 - 70.

Cutts A., Entwistle E., (1988), 'Machine maintenance - the theory and practice', Colliery Guardian, August, pp278-282.

Dankbaar B., (1988a), 'New production concepts, management strategies and the quality of work', Work, Employment and Society, 2, 1, pp25-50.

Dankbaar B., (1988b), 'Teamwork in the West German car industry and the quality of work', in W. Buitellar (ed) Technology and Work. Aldershot: Gower.

Davis M., (1978), 'Fordism in crisis: a review of Michel Aglietta's Regulation et crises du capitalisme', Review 2, 2, pp207-69.

Daws G., (1988), 'Roofbolting in the mining industry', Mine & Quarry, November, pp17-20.

Dennis N., Henriques, Slaughter C., (1954), Coal is our Life: an analysis of a Yorkshire mining community. (1969 edition) London: Tavistock .

Deutschmann C., (1987), 'Economic restructuring and company unionism - the Japanese model', Economic and Industrial Democracy 8, pp463-488.

Dohse K., Jurgens U., Malsch T., (1985), 'From 'Fordism' to 'Toyotism'? The social organisation of the labour process in the Japanese automobile Industry', Politics and Society, 14, 2, pp115-46.

Donovan Lord. (1968), Report of Royal Commission on Trade Unions and Employers (Cmnd. 3623). London: HMSO.

Douglass D., (1977), 'The Durham pitman', in R. Samuel (ed) Miners, Quarrymen and Saltworkers. London: Routledge Kegan Paul.

DTI (1990), Fault Diagnosis and Recovery: Complex Machinery (Expert System Opportunities) London: Department of Trade and Industry.

Dull K., (1984), 'Les nouvelles formes d'organisation du travail -la voie royale?', Report to the International Workshop on New Forms of Work Organisation, Vienna Centre/Institute of Labour Research Budapest, Lake Balaton (Hungary), 13-17th May.

Dull K., (1989) 'New forms of work organisation: case studies from the Federal Republic of Germany, France and Italy', in P. Grootings et al. (eds) New Forms of Work Organisation in Europe. New Brunswick, NJ: Transaction Books.

Dunford M., (1990), 'Theories of regulation', Environment and Planning D: Society and Space, 8, 1, pp297-321.

Dunning J., (1988), 'International business, the recession and economic restructuring', in N. Hood and J.E. Vahlne (eds). Strategies in Global Competition. London: Croom Helm.

Edwardes M., (1983), Back from the Brink. London: Collins

Edwards C., Heery E., (1989) Management control and union power: a study of labour relations in coalmining. Oxford: Clarendon Press.

Edwards P. K., Terry M., (1989) 'Another way forward?', in M. Terry, P.K. Edwards (eds) Shopfloor Poltics and Job Controls. Oxford: Basil Blackwell.

Elbaum B., Lazonick W., (1986), 'An institutional perspective on British decline', in ibid. (eds) The decline of the British Economy. Oxford: Clarendon Press.

Eldon Barry, E., (1965), Nationalisation in British Politics: the historical background. London: Jonathan Cape.

Elger T., (1979), 'Valorisation and 'deskilling': a critique of Braverman', Capital and Class, 7, pp58-99.

Elger T., (1987), 'Flexible futures? New technology and the contemporary transformation of work', Work, Employment and Society, 1, 4, pp528-540.

Elger T., (1990), 'Technical innovation and work reorganisation in British manufacturing in the 1980s: continuity, intensification or transformation?', Work, Employment and Society, Special Issue, pp67-101.

Elger T., (1991), 'Task flexibility and the intensification of labour in UK manufacturing in the 1980s', in A. Pollert (ed) Farewell to Flexibility?. Oxford: Blackwell

Elger T., Fairbrother P., (1990), 'Inflexible flexibility: case study evidence and theoretical considerations', unpublished paper, Department of Sociology, University of Warwick.

Elger T., Schwarz B., (1980), 'Monopoly capitalism and the impact of Taylorism: notes on Lenin, Gramsci, Braverman and Sohn Rethel', in T. Nichol (ed) Capital and Labour: A Marxist Primer. London: Fontana.

Evans P., (1988), 'Big Butty's Back', South Wales Miner, February.

Fairbrother P., (1988), 'Flexibility at work: the challenge for unions', WEA Studies for Trade Unionists, 14, 55/56, December.

Fairclough F., (1960), 'Fast moving faces', Mining Engineer, November, pp77-88.

Feickert D., (1987) 'The midwife of mining', Capital and Class, 31, pp7-15.

Fine B., Harris L., (1985), The Peculiarities of the British Economy. London: Lawrence and Wishart.

Forrest W., (1974), 'A new mine for the eighties', Mining Engineer, March, pp221-224.

Forrest W., (1976), 'Selby', Colliery Guardian, July, pp1-5.

Freidman D., (1988), The Misunderstood Miracle: Industrial Development and Political Change in Japan. Ithaca, NY: Cornell University Press.

Friedman A., (1977), Industry and Labour. London: MacMillan.

Gardner D.C., (1989), 'Managing for Potential', Mining Engineer, April, p466-471.

Garrahan P., Stewart P., (1989), 'Post-Fordism, Japanisation and the local economy: Nissan in the northeast', Conference of Socialist Economists, Sheffield Polythechnic, 7-9 July.

Garrahan P., Stewart P., (1990) 'Nothing new about Nissan?' in C. Law (ed) Restructuring in the Global Automobile Industry. London: Routledge.

Glyn A., (1990), 'Colliery results and closures after the 1984-5 coal dispute', Oxford Bulletin of Economics and Statistics, 50, 2, pp161-72.

Goddard B., (1988), 'Machine reliability - the key to success', Colliery Guardian, August, pp274 - 276.

Gibbon P., Bromley S., (1990), "From an institution to a business'? Changes in the British coal industry, 1985-9', Economy and Society, 19, 1, pp56-94.

Giordano L., (1988), 'Beyond Taylorism: computerisation and QWL programmes and the production process', in D. Knights, H. Wilmott (eds) New Technology and the Labour Process. London: MacMillan.

Goldthorpe J.H., (1959), 'Technical organisation as a factor in supervisor - worker conflict' British Journal of Sociology 10 (3), pp213-30.

Goodrich C., (1921), The Frontier of Control. (1975 edition) London: Pluto Press.

Goodrich C., (1928), The Miner's Freedom: a study of the working life in a changing industry. Boston: Marshall Jones (Arno Press edition, New York, 1977).

Gorz A., (1976), 'The tyranny of the factory: to day and tomorrow' in idem. (ed) The Division of Labour. Brighton: Harvester.

Greaves R., Thompson G., (1986), 'New technology and maintenance requirements', Colliery Guardian, August, pp333-341.

Gronblad S., (1987), 'Production supervision of automatic assembly line at the Volvo Skövde plant', Electronics in Measurement, Automation and Control, April, pp3-5.

Groonbridge J.C., (1970), 'Face management and the role of the chargeman in face operations', Mining Engineer, May, pp475-83.

Hague H., (1991) 'Training a workforce for a competitive world', The Independent on Sunday, 24th March.

Hall S., (1985) 'Realignment for what?', Marxism Today, December.

Hall S., Jacques M., (eds) (1989), The Politics of New Times. London: Lawrence and Wishart.

Hanson C., (1991), Taming the Trade Unions. London: MacMillan/Adam Smith Institute

Harlow C., (1977), Innovation and Productivity under Nationalisation: the first thirty years. London: George Allen and Unwin/PEP.

Harrison T., (1989), 'Wearmouth Colliery, - the challenge', Paper presented to the North of England Institute of Mining and Mechanical Engineers (Junior section), Newcastle upon Tyne, 16th November.

Hartley D., (1991) 'Information technology - state of the art at pits', Mining Engineer, February, pp269-73.

Harvey D., (1989), The Condition of Postmodernity. Oxford: Basil Blackwell.

Haskel J.E., Kay J.A.., (1990), 'Industrial performance under Mrs Thatcher', unpublished paper, Centre for Business Strategy, London Business School, Regents Park, London, NW1.

Heath R.H., (1969), 'The national powerloading agreement in the coal industry and some aspects of workers' control' in K. Coates, T. Topham, M. Barratt Brown (eds) Trade Union Register. London: Merlin Press.

Heizmann J., (1983), 'Work structuring in automated manufacturing systems exemplified by use of industrial robots for body assembly', in T Martin (ed) Design of work in automated manufacturing systems. (IFAC Seminar Karlsruhe, FRG) Oxford: Pergamon.

Heslop H., (1935) Last Cage Down. (1984 edition) London: Lawrence and Wishart.

Hinrichs K., Wiesenthal H., (1984) 'Thesen zur Problematik nichtstandardisierter Arbietszeiten', Sozialer Fortschritt, 33, p277.

Hirst P., Zeitlin J., (1988), 'Crisis, what Crisis?', New Statesman, 18th March, pp10-12.

Hirst P., Zeitlin J., (1989), 'Flexible specialisation and the failure of competitive of UK manufacturing', Political Quarterly, 60, 2, pp164-78.

Holloway J., (1987), 'The Red Rose of Nissan?, Capital and Class, 32, pp142-64.

Hopper T., Cooper D., Lowe T., Capps T., Mouritsen J., (1986), 'Management Control and Worker Resistance in the National Coal Board: Financial Controls in the Labour Process', in D. Knights, H. Willmott (eds) Managing the Labour Process. Aldershot: Gower

Horton E., (1983), 'Mining Techniques in the 1980s', Mining Engineer, February, pp451-455.

Hoss D., (1986), 'Technology and work in the two Germanies', in P. Grootings (ed) Technology and Work: East and West. London: Croom Helm.

Hounshell D., (1984), From the American System to Mass Production. Baltimore: Johns Hopkins University Press.

House of Commons, (1986), The Coal Industry. Report of the Select Committee on Energy (Minutes of Evidence), 196 II, London: HMSO.

Hudson R., (1989), Wrecking a Region. London: Pion.

Hudson R., Sadler D., (1990), 'State policies and the changing geogrpahy of the coal industry in the 1980s and 1990s', Transactions of the Institute of British Geographers, 15, 435-54.

Hyman R., (1988), 'Flexible specialisation: miracle or myth?' in R. Hyman, W. Streeck (eds) New Technology and Industrial Relations. Oxford: Blackwell

Hyman R., (1991), 'Plus ca change? The theory of production and the production of theory', in A Pollert (ed) Farewell to Flexibility. Oxford: Blackwell.

Hyman R., Elger T., (1981), 'Job controls, the employers offensive and alternative strategies', Capital and Class, 15, pp115-149.

IDS (1986), 'Flexibility at Work', IDS Study 360, London: Incomes Data Services Ltd.

Itoh M., 'The Japanese model of Post-Fordism', unpublished paper, Faculty of Economics, University of Tokyo.

Jarvis E., Lewis D.C., (1984), 'Routine condition monitoring', Mining Engineer, August, pp111-118.

Jenson J., (1989), 'The talents of women, the skills of men: flexible specialization and women', in S. Wood (ed) The Transformation of Work?. London: Unwin Hyman.

Jones B., (1989) 'Flexible automation and factory politics: Britain in contemporary perspective' in P. Hirst, J. Zeitlin (eds) Reversing Industrial Decline?. Leamington Spa: Berg.

Jurgens U., (1989), 'The transfer of Japanese management concepts in the international automobile industry', in S. Wood (ed) The Transformation of Work?. (London: Unwin Hyman).

Jurgens U., Dohse K., Malsch T., (1988), 'New production and employment concepts in West German car plants', in S. Tolliday and J. Zeitlin (eds) The Automobile Industry and its Workers. Oxford: Polity Press.

Kamata S., (1980), Japan in the Passing Lane. London: Counterpoint.

Kaplinsky R., (1988), 'Restructuring the capitalist labour process', Cambridge Journal of Economics, 12, pp451-470.

Katz H., Sabel C., (1985), 'Industrial relations and industrial adjustment in the car industry', Industrial Relations, 24, 3, pp295-315.

Kawanishi H., (1986), 'The reality of enterprise unionism', in G. McCormack, Y Sugimoto (eds) Democracy in Contemporary Japan. Armonk, NY: M.E. Sharpe.

Kelly D., (1969), 'The process of mechanisation in British coal mining since 1945', Economic Studies, 4, pp135-151.

Kenney M., Florida., (1988), 'Beyond mass production: production and the labor process in Japan', Politics and Society, 16, 1, pp12158.

Kern H., Schumann M., (1984a), Das Ende der Arbeitsteilung?. Munich: Verlag C H Beck.

Kern H., Schumann M., (1984b) 'Work and social character: old and new contours', Economic and Industrial Democracy, 5, pp51-71.

Kern H., Schumann M., (1987), 'Limits of the division of labour: new production and employment concepts in West German industry', Economic and Industrial Democracy, 8, pp151-170.

Kern H., Schumann M., (1989), 'New concepts of production in West German plants', in P.J. Katzenstein (ed) Industry and Politics in West Germany: toward the third republic. Ithaca: Cornell University Press.

Koike K., (1984), 'Skill formation in the US and Japan: a comparative study', M. Aoki (ed) The Economic Analysis of the Japanese Firm. Amsterdam: Elsevier Science Publishers

Koike K., (1987), 'Human Resource development and labor-management relations' in K. Yamamura, Y. Yasuba (eds) The political economy of Japan: Volume 1: the domestic transformation. Stanford, Ca: Stanford University Press

Krieger J., (1983), Undermining Capitalism: State ownership and the dialetic of control in the British Coal industry. London: Pluto Press.

Kumazawa M., Yamada Y., (1989), 'Jobs and skills under the lifelong nenko practice', in S. Wood (ed) The Transformation of Work?. London: Unwin Hyman.

Lane C., (1988), 'Industrial change in Europe: the pursuit of flexible specialisation in Britain and West Germany?, Work, Employment and Society, 2, 2, pp141-168.

Lappe L., (1988), 'The use of technology and the development of qualifications', in D. Knights, H. Willmott (eds) New Technology and the Labour Process. London: MacMillan.

Law D., (1989a), 'Auto-steerage: an aid to productivity - part one', Mining Engineer, January, pp326-334.

Law D., (1989b), 'Auto - steerage - an aid to productivity: part two' Mining Engineer, February, pp389-392.

Law D., Lukaszewicz P., Cammach P., (1988), 'The application of technology to quality control - machine guidance in South Yorkshire and Larcodems at Point of Ayr Colliery', Mining Engineer, September, pp124-132.

Lazerson M., (1990), 'Subcontracting in the Modena knitwear industry', in F. Pyke, G. Beccantini, W. Sengenberger (eds) Industrial Districts and Inter-firm Cooperation in Italy. Geneva: International Institute for Labour Studies.

Leadbetter C., (1989), 'DTI calls for revolution in manufacturing', Financial Times, 29th November, p28.

Leborgne D., Lipietz A., (1988), 'New technologies, new modes of regulation: some spatial implications', Environment and Planning D: Society and Space, 6, pp263-280

Leman S., Winterton J., (1991), 'New technology and the restructuring of pit-level industrial relations in the British coal industry', New technology, Work and Employment, 6 (1), pp54-64.

Leys C., (1990), 'Still a question of hegemony', New Left Review, 181, pp119-128.

Lewchuk W., (1986), 'The motor vehicle industry', in B. Elbaum, W. Lazonick (eds) The decline of the British Economy. Oxford: Clarendon Press.

Lindholm R., Norstedt J-P., (1975), The Volvo Report, Stockholm: SAF (Swedish Employers' Confederation).

Lipietz A., (1987), 'Behind the crisis: the tendency of the rate of profit to fall - a 'regulation school' perspective on some French empirical works', Review of Radical Political Economy, 18, pp13-32.

Littler G., (1982), The Development of the Labour Process in Capitalist Societies. London: Heinemann.

Littler G., (1983), 'A history of 'new' technology', in G. Winch (ed) Information Technology in Manufacturing Processes. London: Rossendale.

Lloyd J., (1985), Understanding the Miners' Strike. (Fabian Tract 504) London: Fabian Society.

Longden J.E., Webster N.E., (1959), 'The efficiency of large and small collieries', Transactions of the Institution of Mining Engineers Vol 119, 1959-1960, pp125-137.

Lyddon D., (1990), 'The industrial relations of decline, not the decline of industrial relations', in P. Stewart, P. Garrrahan, S. Crowther, (eds) Restructuring for Economic Flexibility. Aldershot: Avebury.

MacGregor I., (with Tyler I.), (1986), The Enemies Within: the story of the miners' strike 1984-85. London: Collins.

MacIntosh M., Wainwright H., (1987), A Taste of Power. London: Verso

Malsch T., Dohse K., Jurgens U., (1984), 'Industrial robots in the Automobile industry. A leap toward 'Automated Fordism'?', LLVG/dp 84-222, Berlin: Wissenschaftszentrum.

Marsden D., Morris T., Willman P., Wood S., (1985), The Car Industry: Labour Relations and Industrial Adjustment. London: Tavistock

Marx K., (1973), Grundrisse. Harmondswoth: Penguin.

Marx K., (1974a), Capital Vol. 1. Harmondsworth: Penguin.

Marx K., (1974b), Capital Vol. 3. London: Lawrence and Wishart.

Massey D., (1984), Spatial Divisions of Labour. London: MacMillan

Massey C.T., (1989) 'Low cost coal - the technological contribution', Colliery Guardian, August, pp227 - 228.

Maynard G., (1988), The economy under Mrs Thatcher. Oxford: Basil Blackwell.

Metcalf D., (1988), 'Water notes dry up: the impact of the Donovan Reform Proposals and Thatcherism at Work on Labour Productivity in British Manufacturing', British Journal of Industrial Relations, 27, 1, pp1-31

Mickler M., (1989) 'Introduction and use of CNC in the Federal Republic of Germany' in A. Francis, P. Grootings (eds) New Technologies and Work: capitalist and socialist perspectives. London: Routledge.

Mining Magazine, (1983), 'Progress at Selby: 1 - overall project concept; the Wistow mine', June, pp416-421.

Mining Magazine, (1983), 'Progress at Selby: 2 - Conveyor Systems in the North and South drifts', June, pp425 - 431.

Mining Magazine, (1983), 'Progress at Selby: 3 - Gascoigne Wood facilities', June, pp433-437.

Moore J., (1983), Japanese Workers and the Struggle for power 1945 - 1947 Madison, Wi: University of Wisconsin Press.

Moore D., (1990), 'Meeting the challenges', Mining Engineer, April, pp369-373.

Molyneux R., Thompson D., (1987), 'Nationalised industry performance: still third rate?', Fiscal Studies 8, 1, pp48-82.

Monden Y., (1981), 'What makes the Toyota system really tick', Industrial Engineering, January, pp36-46

Monopolies and Mergers Commission (1983) National Coal Board. London: HMSO.

Monopolies and Mergers Commission (1989), British Coal Corporation. A report on the investment strategy of British Coal Corporation. London: HMSO.

Morroni M., (1990), 'Production flexibility', Paper presented to the annual conference of the European Association for Evolutionary Political Economy, 15-17 November, Florence.

Moses K., (1986), 'The need to cut costs', Mining Engineer, July, pp11-12.

Murray F., (1983), 'The decentralisation of production and the decline of the mass collective workers', Capital and Class, 19, pp.

Murray F., (1987) 'Flexible specialisation in the 'Third Italy'', Capital and Class, 33, pp84-95.

Murray R., (1985), 'Benetton Britain', Marxism Today, November, pp28-32.

Murray R., (1989), 'Life after Henry (Ford)', Marxism Today, October, pp8-13.

Murray H., Spink P., (1979) Sociotechnical systems in mining (1951, 1955, 1969): Three follow-up studies. London: Tavistock Institue of Human Relations.

Muto I., (1984), 'Class struggle on the shopfloor: the Japanses case, 1945-84', AMPO: Japan-Asia Quarterly Review, 16, 4, pp38-49.

Muto I., (1986), 'Class struggle in post-war Japan', in G. McCormack, Y. Sugimoto (eds) Democracy in Contemporary Japan. Armonk, NY: M.E. Sharpe.

Negri A., (1990), Revolution Retrieved: Selected Writings. 1967-83. London: Red Notes

Nolan P., (1989a), 'Walking on water? Performance and industrial relations under Thatcher', Industrial Relations Journal, 20, 2, pp81-92.

Nolan P., (1989b), 'The productivity miracle?', in F. Green (ed) The Restructuring of the UK Economy. London: Harvester/Wheatsheaf.

Nolan P., O'Donnell K., (1987), 'Taming the market economy? A critical assessment of the GLC's experiment in restructuring for labour', Cambridge Journal of Economics, 11, 251-263.

Nolan P., O'Donnell K., (1991), 'Flexible specialisation and UK manufacturing', Political Quarterly, 62, 1, pp106-124.

Northard J., (1987), 'Wind of change' - management response', Mining Engineer, September, pp107-115.

Northard J., (1988), 'Light at the end of the tunnel', Mining Technology, August, pp244-249.

NUM (1987), 'New proposed working practices in British deep coal mining', unpublished paper, National Union of Mineworkers, Sheffield.

NUM (1989) 'The attack on union organisation in the deep-mined coal industry', unpublished paper, National Union of Mineworkers, Sheffield.

O'Donnell K., (1988), 'Pit closures in the British coal industry: a comparison of the 1960s and 1980s', International Review of Applied Economics, 2, 1, pp62-77.

OECD (1988), OECD Economic Surveys: United Kingdom, 1987/8. Paris: Organisation of Economic Cooperation and Development.

Oliver N., Wilkinson B., (1988), The Japanisation of British Industry. Oxford: Basil Blackwell.

Palloix C., (1976), 'The labour process from Fordism to neo-Fordism' in Conference of Socialist Economists, The Labour Process and Class Strategies. London: Stage One.

Parker M., Slaughter M. (1990), 'Management-by-stress: the team concept in the US automobile industry', Science as Culture, 8, pp27-58.

Parkins J., (1989), 'Managing for Tomorrow - Today', Mining Engineer, June, pp535-539.

Parnaby J., (1987), 'Competitiveness via total quality performance' Progress in Rubber and Plastics Technology, 3, 1, pp42-50.

Partridge H (1984), 'Designed by computer, built by robot: the labour process and class relations in FIAT', Working Paper 17,

Department of Sociology, University of Durham.

Penn R., (1990), Class, Power and Technology. Cambridge: Polity Press.

PEP, (1936), Report on the British Coalmining Industry. London: Political & Economic Planning.

Papadimitriou Z., (1986), 'Changing skill requirements and trade union bargaining' in O. Jacobi et al. (eds) Technological change, Rationalisation and Industrial Relations. London: Croom Helm.

Piore M., (1990) 'Work, labour and action: the experience of work in a flexible system of production', in F. Pyke, G. BeccatininW. Sengenberger (eds) Industrial Districts and Inter-firm Cooperation in Italy. Geneva: International Institure for Labour Studies.

Piore M., Sabel C., (1984), The Second Industrial Divide. New York: Basic Books.

Pollard M., (1976), 'Selby - the mine' in R Vielvoye et al. Coal: Technology for Britain's Future. London: MacMillan.

Pollert A., (1988), 'Dismantling flexibility', Capital and Class, 34, pp42-75.

Pontusson J., (1990), 'The politics of new technology and job redesign: a comparison of Volvo and British Leyland', Economic and Industrial Democracy, 11, pp311-336.

Prior M., McCloskey G., (1986), Coal on the Market. London FT Business Information Ltd.

Reid C., (Chairman), (1945), Coal Mining : Report of the Technical Advisory Committee, Ministry of Fuel and Power (Cmd 6610) London: HMSO

Renouf J., (1990), A Striking Change: political change in two branches of the National Union Mineworkers, PhD Thesis, University of Durham.

Rees P.B., ((1976a), 'Selby - a new era for coal', Coal and Energy Quarterly, Summer, pp28-34.

Rees P.B., (1976b), 'New high output underground mines in Great Britain with specific reference to the Selby project', Mining Magazine, June, 503-515

Revelli M., (1982), 'Defeat at FIAT', Capital and Class, 16, pp95-109.

Richardson R., Wood S., (1989), 'Productivity change in the Coal industry and the new industrial relations', British Journal of Industrial Relations, 27 (1), pp33-35.

Robinson R., Harrison T., (1987), 'Controlled recirculation of air at Wearmouth Colliery', Colliery Guardian, August, pp247-277.

Rollier M., (1986), 'Changes of industrial at FIAT', in O Jacobi et al. (eds) Technological Change, Rationalisation and Industrial Relations. London: Croom Helm

Rutledge I., (1977), 'Changes in the mode of production and the growth of mass militancy in British mining', Science and Society, 44, pp410-429.

Sabel C., (1982), Work and Politics. The division of labour in society, Cambridge: Cambridge University Press.

Sabel (1989) C., 'The re-emergence of regional economies?' in P. Hirst J. Zeitlin (eds) Reversing Industrial Decline. Leamington Spa: Berg.

Samuel H.L., (1925) Report of the Royal Commission on the Coal Industry (Cmd 2600). London: HMSO.

Sayer A., (1985), 'Industry and space: a sympathetic critique of radical research, Environment and Planning D: Society and Space, 3, 1, pp3-29.

Sayer A., (1986), ' New developments in manufacturing: the just in time system', Capital and Class, 30, pp43-72.

Scarbrough H., (1984), 'Maintenance workers and new technology: the case of Longbridge', Industrial Relations Journal, 15, 4, pp9-17.

Scarbrough H., (1986), 'The politics of technological change at British Leyland', in O. Jacobi, B. Jessop, H. Kastendich, M. Regini (eds) Technological Change, Rationalisation and Industrial Relations. Beckenham: Croom Helm.

Scarbrough H., Moran P., (1985), 'How new tech won at Longbridge', New Society, 7th February, pp207-209.

Schonberger R.J., (1982), Japanese Manufacturing Techniques: nine hidden lessons in simplicity. New York: Free Press.

Schudlich E., (1989), 'Between consensus and conflict: the development of industrial working time in the FRG', in J. Buber Agassi, S. Heycock (eds) The Redesign of Working Time: Promise and Threat?. Berlin: Sigma Verlag.

Schumann M., (1987) 'The future of work, training and innovation' In W. Wobbe (ed) Flexible Manufacturing in Europe: state of the art approaches and diffusion patterns. (FAST Occasional Papers No. 155). Brussels: European Commission.

Schumann M., (1990) 'New forms of work organization in West German industrial enterprises', unpublished paper, Soziologisches

Forschungsintitut Gottingen.

Schwarz B., (1985) 'Let them eat coal: the Conservative Party and the Strike' in H. Beynon (ed) Digging Deeper: Issues in the miners' strike. London: Verso.

Scott A., Noble W., (1954), 'Machine mining: concentration in space and time', Transactions of the Institution of Mining Engineers, 114, 1954-55, pp255 - 280.

Searle Barnes R.G., (1969), Pay and Productivity. Manchester: Manchester University Press.

Shaiken H., Herzenberg S., Kuhn S., (1986), 'The work process under more flexible production', Industrial Relations, 25, 2, pp167-183.

Sheppard W.V., (1951 'An experiment in continuous longwall mining at Bolsover colliery', Transactions - Institution of Mining Engineers, Vol. 110, 1950-51, pp475-492.

Shirai T., (1983) 'Japanese labor unions and politics', in idem. (ed) Contemporary Industrial Relations in Japan. Madison, Wi: University of Wisconsin Press.

Siddall R.G., (1988), 'In seam drivages within the Selby coalfield', Mining Engineer, March, pp397-403.

Siddall R., (1989), 'Selby - an update on progress', Mining Engineer, December, pp227-234.

Slaughter C., (1958), 'The strike of Yorkshire mineworkers, May 1955' Sociological Review, 6, 6, pp241-259.

Smith C., (1989) 'Flexible specialisation, automation and mass production' Work, Employment and Society 3, 2, pp203-20.

Smith C., Child J., Rowlinson M., (1990), Reshaping Work: the Cadbury experience. Cambridge: Cambridge University Press.

Sohn Rethel A., (1978), Intellectual and Manual Labour. Atlantic Highlands, NJ: Humanities Press.

Sorge A., Streeck W., (1988) 'Industrial relations and technical change: the case for an extended perspective' in R. Hyman, W. Streeck (eds) New Technology and Industrial Relations. Oxford: Basil Blackwell.

Spanton M., (1982), 'Containing costs with mechanisation', Mine & Quarry, January/February, pp27-34.

Spanton H.M., (1985), 'Men, Management and New Technology', Mining Engineer, September, pp81-84.

Spriano G., (1985), 'Technological choices and spatial organization of production in the Fiat system', Geography Discussion Paper 12, Department of Geography, London School of Economics.

Steel W.T., (1988), 'The development of management information systems for running machines at full potential', Colliery Guardian August, pp288-292.

Steel W.T., (1989), 'CIS - Vax update', Colliery Guardian, July, pp122-214.

Stott A.G., (1988), 'Selby - making of a modern mine', Colliery Guardian, January, pp6-10.

Streeck W., (1985), Industrial Relations in West Germany. London: Heinemann/Policy Studies Institute.

Streeck W., (1989), 'The uncertainties of management in the management of uncertainty', Work, Employment and Society, 1, 3, pp281-308.

Sugimori Y., Kusunoki., Cho F., Uchikawa S., (1977), 'Toyota production system and Kanban system: materialization of just-in-time and respect for human system', International Journal for Production Research, 15, 6, 553-64.

Sugimoto Y., (1986), 'The manipulative bases of 'consensus' in Japan', in G. McCormack, Y Sugimoto (eds) Democracy in Contemporary Japan. Armonk NY: M.E. Sharpe

Tailby S., Whitston C., (1989), Manufacturing Change: Industrial Relations and Restructuring. Oxford: Basil Blackwell.

Taylor A., (1990), 'The CEGB and the restructuring of British Coal', Royal Bank of Scotland Review, 165,pp36-45.

Taylor B., Elger T., Fairbrother P., (1991), 'Work relations in electronics: waht has become of Japanisation in Britain', Paper presented to the Ninth International Labour Process Conference, UMIST, Manchester, April.

Taylor F.W., (1947), Scientific Management. New York: Harper.

Terry M., (1989), 'Recontextualising shopfloor industrial relations', in S Tailby, C Whitston (eds) Manufacturing Change. Oxford: Blackwell.

Thomas D., (1983), 'The new coal miners', New Society, 12th May, pp209-210.

Thompson E.P., (1967), 'Time work-discipline and industrial capitalism', Past and Present, 38.

Thompson P., (1989), The Nature of Work. London: MacMillan.

Tokunaga S., (1983), 'A marxist interpretation of Japanese industrial relations, with special reference to large private enterprises', in T. Shirai (ed) Contemporary Industrial Relations in Japan. Madison, Wi: University of Wisconsin Press.

Tomaney J., (1989), 'Workplace flexibility in the North East', Northern Economic Review, 18, pp16-29.

Tomaney J., (1990), 'The reality of workplace flexibility', Capital and Class, 40, pp29-60.

Tomaney J., (1991), 'Japanese inward investment and regional development: the experience of North East England', paper presented to the workshop on 'The organisation of transnational companies', Industrial Relations Research Unit, University of Warwick, 4-5th July 1991.

Tomaney J., Winterton J., (1990), 'Technical change and the transformation of work in the British coal industry' paper presented to 12th World Congress of Sociology, Madrid, 12-14th July.

Townsend J., (1976), Innovation in coal mining machinery: 'The Anderton Shearer Loader', SPRU Occasional Paper 3, Science Policy Reaserch Unit, University of Sussex, Brighton.

Tregelles P., (1984), 'Microelectronics in Mining Operations', Mining Engineer, March, pp401-5.

Tregelles P., (1986), 'The R & D History of Computer-based Control Technology in the Mining Industry', Mining Engineer, October, pp211-216.

Trist E., Bamforth K., (1951), 'Some social and psychological consequences of the longwall method of coalgetting', Human Relations, 4, 1, pp1-38.

Trist E., Higgin J.W., Murray H., Pollack A.B., (1963), Organizational Choice. London: Tavistock.

Tucker R.H., (1986), 'The contribution of developing technologies to transport efficiency in the National Coal Board', Mining Engineer, October, pp378-385.

Tuke A., (1989) 'Europe's largest mining complex - the Selby mine', ECRO Annual Prestige Lecture, 14th November.

Turnbull P., (1987), 'The limits to 'Japanisation' - Just in time, labour relations and the UK automotive industry' New Technology, Work and Employment, 3, 1, pp.

Turnbull R., (n.d.) Chopwell's Story. Gateshead: Gateshead MBC.

TUSIU (1988), Coalmining: health and safety. Newcastle: Trade Union

Studies Information Unit.

Walker R., (1989), 'Machinery, labour and location', in S. Wood (ed) The Transformation of Work?. London: Unwin Hyman.

Waller R., (1985), The Dukeries Transformed. Oxford: Clarendon Press.

Watanabe B., (1990), 'The Japanese labor movement: toward total dissolution?', AMPO Japan-Asia Quarterly Review, 20, 2/21, 1, pp60-71.

Watson T.P., (1990), 'The development of mineral transportation systems at Westoe colliery', Paper presented to the North of England Institute of Mining and Mechanical Engineers, Neville Hall, Newcastle, 29th March 1990.

Watt R., (1984), 'The contribution of efficient underground transport systems to improving EBG efficiency and machine available time', Mining Engineer, October, pp207-214.

Wheeler A., (1986), 'Frontiers and Forward - colliery production and productivity' Mining Engineer, September, pp152-160.

Wheeler A., (1988), 'The need for heavy-duty face equipment', Coal, (Special supplement: British Technology in Mining), pp14-21.

Whitworth K., (1989), 'Selby complex sets a record pace', Coal, October, pp56-58.

Wickens P., (1987), The Road to Nissan. London: MacMillan.

Wiedemayer M., (1989), 'New technology in West Germany: the employment debate', New Technology, Work and Employment, 4, 1, pp54-65.

Wilkinson B., Oliver N., (1989), 'Obstacles to Japanisation: the case of Ford UK', Employee Relations, 12, 1, pp17-21.

Williams K., Haslam C., Wardlow A., Williams J., (1986), 'Accounting for failure in the nationalised enterprises - coal, steel and cars since 1970', Economy and Society, 15, 2, pp167-217.

Williams K., Cutler T., Williams J., Haslam C., (1987), 'The End of Mass production?', Economy and Society 16, 3, pp405-439.

Williams K., Williams J., Haslam C., (1990), 'The hollowing out of British manufacturing and its implications for policy', Economy and Society, 19, 4, pp456-490.

Willman P., Winch G., (1985), Innovation and Managerial Control: Labour Relations at BL Cars. Cambridge: Cambridge University Press.

Windolf P., (1985), 'Industrial robots in West German Industry' Politics and Society, 14 (4) pp459-95.

Winfield G., (1987) , The Social Science PhD: the ESRC inquiry into submission rates. London: Economic and Social Research Council.

Winterton J., (1981) 'The trend of strikes in coalmining', Industrial Relations Journal, 12, 6, pp10-19.

Winterton J., (1985), 'Computerised coal: new technology in the mines' in H Beynon (ed) Digging Deeper: issues in the miners' strike. London: Verso.

Winterton J., Winterton R., (1989) Coal Crisis and Conflict: the 1984/5 Miners' Strike in Yorkshire. Manchester: Manchester University Press.

Wood S., (1989), 'From Braverman to Cyberman: a critique of the flexible specialisation thesis', in W Buitelaar (ed) Technology and Work. Aldershot: Avebury

Zeitlin J., (1980), 'The emergence of the shop steward organization and job control in the British car industry', History Workshop, 10, pp119-37.